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WHC-EP-0342
Addendum 5

PUREX Plant Steam Condensate Stream-Specific Report

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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PUREX Plant Steam Condensate Stream-Specific Report

PUREX/UO_3 Operations

Date Published
August 1990

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
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PUREX STEAM CONDENSATE STREAM-SPECIFIC REPORT

PUREX/UO_3 Operations

ABSTRACT

The proposed wastestream designation for the Plutonium-Uranium Extraction (PUREX) Plant Steam Condensate (SCD) wastestream is that this stream is not a dangerous waste, pursuant to the Washington (State) Administration Code (WAC) 173-303, Dangerous Waste Regulations.* *A combination of process knowledge and present sampling data was used to make this determination.*

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*Ecology, 1989, *Dangerous Waste Regulations*, Washington (State) Administrative Code (WAC) 173-303, Washington State Department of Ecology, Olympia, Washington.

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EXECUTIVE SUMMARY

The proposed dangerous waste designation for the Plutonium-Uranium Extraction (PUREX) Plant SCD (sometimes called the Steam Condensate wastestream) is that this stream is not a dangerous waste, pursuant to the Washington (State) Administrative Code (WAC) 173-303, *Dangerous Waste Regulations**. A combination of process knowledge and present sampling data was used to determine if the effluent contains a listed dangerous waste (WAC 173-303-080). Sampling data alone are compared to the dangerous waste criteria (WAC 173-303-100) and dangerous waste characteristics (WAC 173-303-090).

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*Ecology, 1989, *Dangerous Waste Regulations*, Washington (State) Administrative Code 173-303, Washington State Department of Ecology, Olympia, Washington.

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LIST OF TERMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Recovery Act*
CI	confidence interval
conc%	percent concentration
DOE	U.S. Department of Energy
DWS	drinking water standards
EC%	percent equivalent concentration
Ecology	Washington State Department of Ecology
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
HH	halogenated hydrocarbon
MSDS	Material Safety Data Sheet
P&O	pipe and operating gallery
PAH	polycyclic aromatic hydrocarbon
PUREX	Plutonium-Uranium Extraction
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
WAC	Washington (State) Administrative Code

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PUREX PLANT STEAM CONDENSATE STREAM-SPECIFIC REPORT

1.0 INTRODUCTION

1.1 BACKGROUND

In response to the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), hereinafter referred to as the Tri-Party Agreement, comments were received from the public regarding reduction of the discharge of liquid effluents into the soil column. As a result, the U.S. Department of Energy (DOE), with concurrence of the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA), committed to assess the contaminant migration potential of liquid discharges at the Hanford Site (Lawrence 1989).

This assessment is described in the *Liquid Effluent Study Project Plan* (WHC 1990b). A portion of this study consists of characterizing 33 liquid effluent streams. The characterization consists of comparing the process data and sampling data with dangerous waste regulations pursuant to the Washington Administrative Code (WAC) 173-303 (Ecology 1989). The comparisons and followup investigations will provide a designation of the stream in accordance with WAC 173-303 and may provide priorities for further cleanup of some streams.

The results of the characterization study are documented in 33 separate reports, one report per wastestream. The complete list of stream-specific reports appears in Table 1-1. This document is one of the 33 reports.

1.2 APPROACH

This report characterizes the Plutonium-Uranium Extraction (PUREX) Plant SCD (also known as Steam Condensate) in sufficient detail so that a dangerous waste designation, in accordance with WAC 173-303, can be proposed.

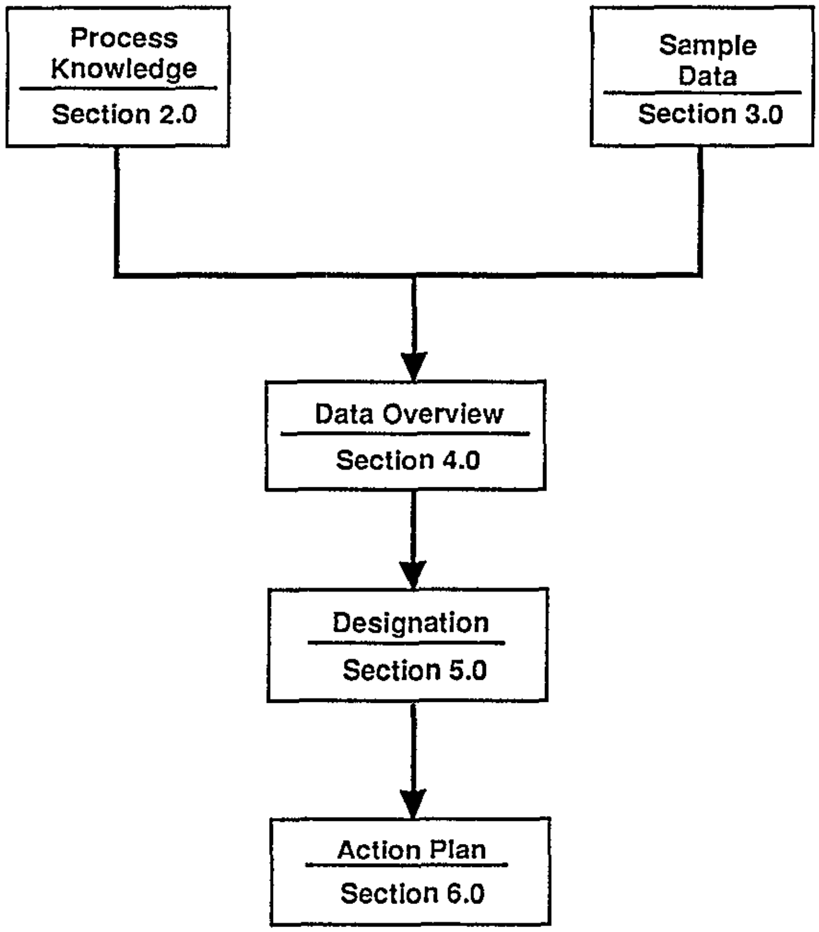
This characterization strategy (see Figure 1-1) is implemented by means of the following steps.

- Describe both process knowledge and sampling data (Sections 2.0 and 3.0), respectively.
- Compare the data (Section 4.0).
- Propose a designation (Section 5.0).
- Design an action plan, if needed, to obtain additional characterization data (Section 6.0).

Table 1-1. Stream-Specific Characterization Reports.

WHC-EP-0342	Addendum 1	300 Area Process Wastewater
WHC-EP-0342	Addendum 2	PUREX Plant Chemical Sewer
WHC-EP-0342	Addendum 3	N Reactor Effluent
WHC-EP-0342	Addendum 4	163N Demineralization Plant Wastewater
WHC-EP-0342	Addendum 5	PUREX Plant Steam Condensate
WHC-EP-0342	Addendum 6	B Plant Chemical Sewer
WHC-EP-0342	Addendum 7	UO_3/U Plant Wastewater
WHC-EP-0342	Addendum 8	Plutonium Finishing Plant Wastewater
WHC-EP-0342	Addendum 9	S Plant Wastewater
WHC-EP-0342	Addendum 10	T Plant Wastewater
WHC-EP-0342	Addendum 11	2724-W Laundry Wastewater
WHC-EP-0342	Addendum 12	PUREX Plant Process Condensate
WHC-EP-0342	Addendum 13	222-S Laboratory Wastewater
WHC-EP-0342	Addendum 14	PUREX Plant Ammonia Scrubber Condensate
WHC-EP-0342	Addendum 15	242-A Evaporator Process Condensate
WHC-EP-0342	Addendum 16	B Plant Steam Condensate
WHC-EP-0342	Addendum 17	B Plant Process Condensate
WHC-EP-0342	Addendum 18	2101-M Laboratory Wastewater
WHC-EP-0342	Addendum 19	UO_3 Plant Process Condensate
WHC-EP-0342	Addendum 20	PUREX Plant Cooling Water
WHC-EP-0342	Addendum 21	242-A Evaporator Cooling Water
WHC-EP-0342	Addendum 22	B Plant Cooling Water
WHC-EP-0342	Addendum 23	241-A Tank Farm Cooling Water
WHC-EP-0342	Addendum 24	284-E Powerplant Wastewater
WHC-EP-0342	Addendum 25	244-AR Vault Cooling Water
WHC-EP-0342	Addendum 26	242-A Evaporator Steam Condensate
WHC-EP-0342	Addendum 27	284-W Powerplant Wastewater
WHC-EP-0342	Addendum 28	400 Area Secondary Cooling Water
WHC-EP-0342	Addendum 29	242-S Evaporator Steam Condensate
WHC-EP-0342	Addendum 30	241-AY/AZ Tank Farms Steam Condensate
WHC-EP-0342	Addendum 31	209-E Laboratory Reflector Water
WHC-EP-0342	Addendum 32	T Plant Laboratory Wastewater
WHC-EP-0342	Addendum 33	183-D Filter Backwash Wastewater

Figure 1-1. Characterization Strategy.



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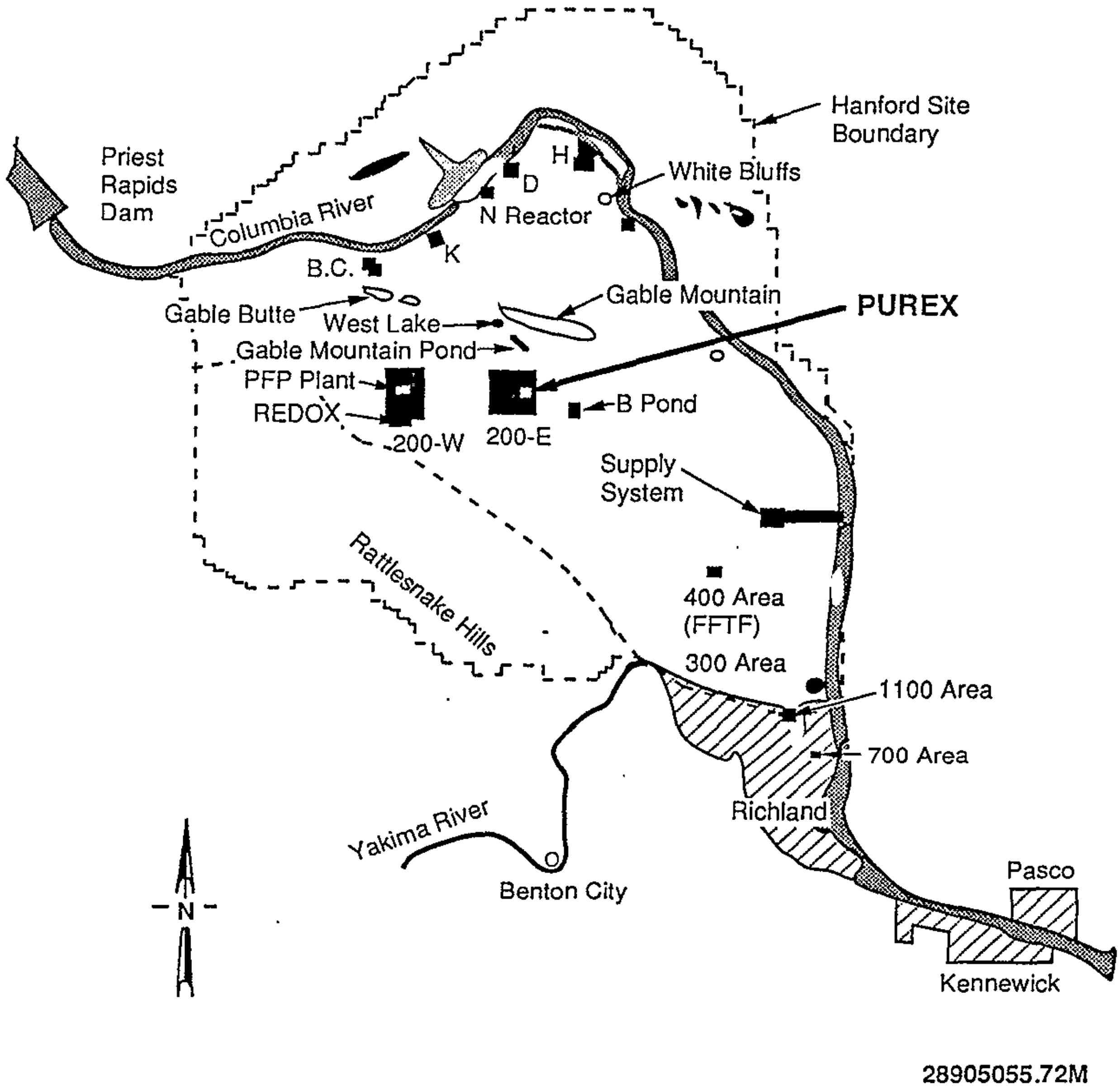
1.3 SCOPE

The scope of this report is to characterize the PUREX Plant SCD that is currently being discharged to the 216-A-30 Crib and the 216-A-37-2 Crib (Figure 1-2), where it percolates into the ground. This report does not address any other wastestream leaving the PUREX Plant, including solid, gaseous, or sanitary waste.

Historical changes, process campaign changes, and sampling data are considered only if relevant to the characterization of the wastestream as it presently exists. Future process modifications are addressed only if they will significantly alter the present effluent. The collection of chemical characterization data began in 1985. Stream designation is based on new data taken from October 1989 to March 1990 samples.

Figure 1-2. Location of the PUREX Plant within the Hanford Site.



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2.0 PROCESS KNOWLEDGE

This section presents a qualitative and quantitative process knowledge-based characterization of the chemical and radiological constituents of the PUREX Plant SCD. These process data are discussed in terms of the following factors:

- Location and physical layout of the process facility
- Identity of the wastestream contributors
- General description of the present, past, and future activities of the process
- Concentration of the constituents of each contributor.

The PUREX Plant SCD consists almost entirely of condensed steam and warm raw water that have been used to control the temperature of certain process vessels (raw water is untreated Columbia River water). The vessels involved are those process vessels that could potentially experience steam or cooling coil failure and radionuclide release. The PUREX Plant SCD consists of condensate from steam that has passed through heating coils and from water that has passed through cooling coils. No chemicals are added to the SCD in the PUREX Plant, although some corrosion products may be expected to be contributed by the PUREX Plant piping. Some radionuclides may also be added through failure of heat transfer surfaces. Radiation process control monitors are in use to automatically divert this stream to a diversion basin in order to provide containment in the event of above-normal levels of radioactivity.

Stream sampling is performed on the common discharge header of the steam condensate after the lateral flows enter the common duct. It is considered impractical to sample individual contributors because of safety issues including high temperature fluids and radiation fields. Sampling provisions on individual input lines were not designed into the system. Additional sampling points would require engineering studies, development, and installation. The incoming laterals are 10 ft below grade level and may contain two phase flow, thus requiring special sampling equipment. The existing equipment incorporates a quench flow added near the start of the collection header to ensure that the header flow is liquid phase at the sampling point (Figure 2-7).

2.1 PHYSICAL LAYOUT

The PUREX Plant is a collection of buildings and facilities located in the 200 East Area of the Hanford Site. The main building, 202-A (Figure 2-1), is a heavily shielded, reinforced concrete structure known as a canyon building. This building contains the main equipment used in the PUREX Plant

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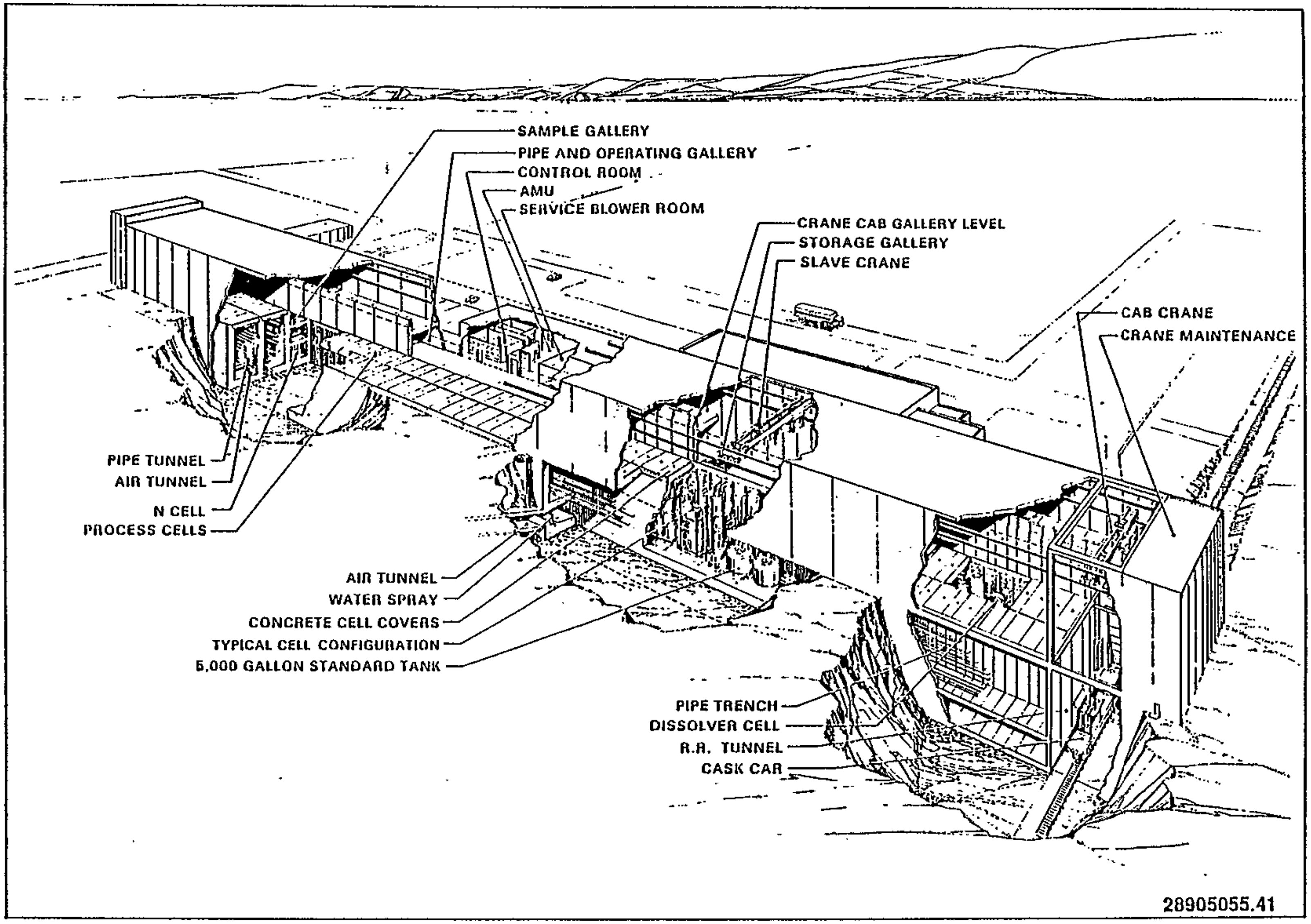


Figure 2-1. The 202-A Building.

process. The main PUREX Plant building contributes steam condensate and cooling water from its vessels. The PUREX Plant facilities that add water to the steam condensate stream are as follows:

- Process cells A, B, C, E, F, H, and J
- Pipe and Operating (P&O) Gallery mezzanine
- Railroad tunnel
- Steam condensate alpha monitor
- Fuel storage basin.

The location of the PUREX Plant within the Hanford Site is shown in Figure 1-2. Figure 2-2 is a plot plan for the PUREX Plant.

The 202-A Building is 1,005 ft long, 119 ft wide at its widest point, and about 100 ft high, with approximately 40 ft of this height below grade. The canyon runs nearly the length of the 202-A Building and contains and shields the process equipment used for processing irradiated nuclear fuel. The canyon also contains other facilities, including the process cells where process vessels are located (Figure 2-3).

The process cells are rooms, shielded with massive concrete, which contain most of the process equipment. The floor of the canyon cells is a layer of reinforced concrete nearly 6-ft thick. The process cells are covered by cover blocks, which are removable blocks of reinforced concrete designed to provide radiation shielding.

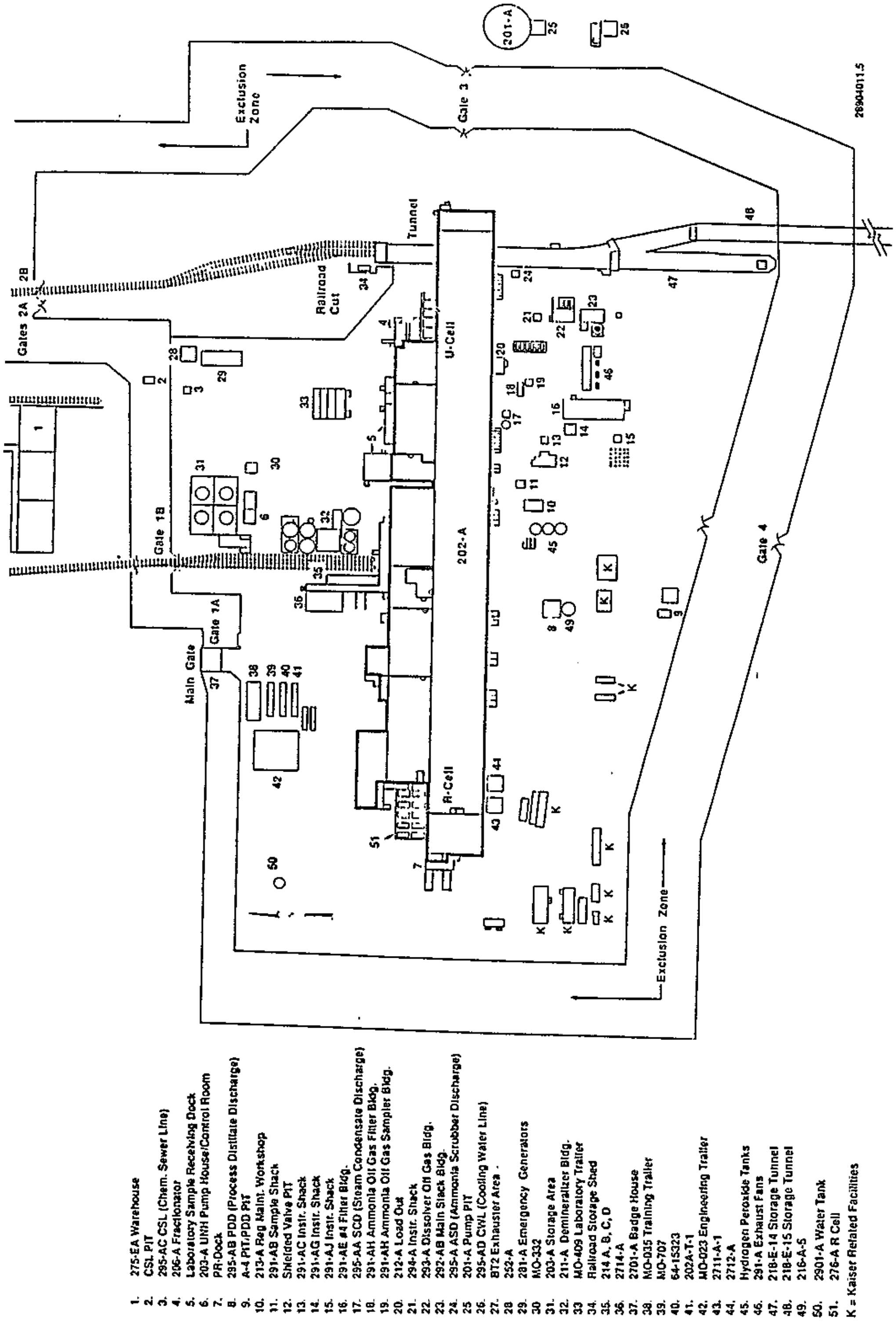
The P&O Gallery contains "cold side" (nonradioactive) piping to the process. The P&O Gallery mezzanine is located at the east end of the P&O Gallery.

The railroad tunnel is used for receiving irradiated fuel and large pieces of equipment transported to PUREX via railcars. The railroad tunnel enters the north side of the east end of Building 202-A, continues through the building, exits on the south side of the building and connects to the storage tunnels. The storage tunnels are two parallel, earth-covered tunnels that contain railroad tracks. The storage tunnels are isolated from the railroad tunnel by water fillable doors and contain failed equipment (loaded on railroad cars) that is contaminated with high levels of radioactivity or that is too bulky for immediate burial. Storage of the equipment allows the radioactivity to decay to less dangerous levels.

Occasionally the alpha monitor and sample supply lines are backflushed to ensure good flow to the monitors located in 295-AA shown in Figure 2-2.

The fuel storage basin is used to store nuclear fuels before processing in the PUREX Plant. The fuel storage basin is located in the canyon near the railroad tunnel at the east end of the 202-A Building.

Figure 2-2. The PUREX Plant Plot Plan.



2.2 CONTRIBUTORS

Table 2-1 is a listing of the contributors to the PUREX Plant SCD. Contributors are of three types:

- Concentrator tube bundles
- Vessel coils
- Miscellaneous waste sources.

The concentrator and silver-reactor steam condensates consist of condensed steam that may become contaminated by leaks or from residues in the piping from previous leaks. When a leak test is performed on a concentrator tube bundle, the effluent from that tube bundle will consist of raw (river) water.

The tank heating and cooling effluents consist of warmed raw (river) water used for cooling and condensed steam used for heating. These water streams can also become contaminated by coil leaks and residues deposited in the piping by previous coil leaks.

The miscellaneous wastes include drainage from the personnel decontamination shower located in the east end of the P&O mezzanine, drainage from the railroad tunnel, liquid from the fuel storage basin located in the PUREX Plant canyon and occasional raw water backflushing of the radiation monitors. The personnel decontamination shower is not used often. It can contribute sanitary water contaminated with radionuclides, surfactants, and other personnel-decontaminating agents. The fuel storage basin does not normally contribute any effluent. Its effluent, if present, would consist of water that may be contaminated with radionuclides. The railroad tunnel (on the south side of Building 202-A) primarily contributes condensate, but can also contribute raw water (used for cleaning) and rainwater contaminated with radionuclides. This drainage (minor and intermittent flow) may enter the header downstream of the sampling point. An investigation, including the examination of old facility modification records, will continue until this issue is resolved. Any lines not routed upstream of the sample point will be rerouted or blanked.

2.3 PROCESS DESCRIPTIONS

2.3.1 Present Activities

Present activities cover the interval from October 1989 to March 1990. The discussion of present activities proceeds in three parts. The first gives an overview of processing at the PUREX Plant, with emphasis on the liquid effluents traditionally released. The second discusses the SCD process itself. The third discusses administrative controls.

2.3.1.1 PUREX Overview. The PUREX Plant, located in the 200 East Area of the DOE's Hanford Site in southeast Washington, separates usable actinides from fission products in irradiated nuclear fuel. Briefly, the process

Table 2-1. The PUREX Plant Steam Condensate Contributors.

Contributor location	Process unit	Source description
	Concentrator tube bundles (steam condensate)	
202A, J Cell	E-J8	Concentrator steam condensate
202A, H Cell	E-H4-1	Concentrator steam condensate
202A, F Cell	E-F11-1	Concentrator steam condensate
202A, F Cell	E-F6	Concentrator steam condensate
	Vessel coils (steam condensate or cooling water)	
202A, J Cell	Tk-J5	2A Feed Tank coil
202A, H Cell	Tk-H1	HA Feed Tank coil
202A, F Cell	Tk-F16	High-level waste tank coil
202A, F Cell	Tk-F15	Denitration tank coil
202A, F Cell	Tk-F8	Rework tank coil
202A, E Cell	Tk-E6	Solvent extraction feed adjustment tank coil
202A, E Cell	Tk-E1	Zirflex actinide recovery tank coil
202A, C Cell	Tk-C3	Dissolver coil
202A, C Cell	T-C2	Silver-reactor steam condensate
202A, B Cell	Tk-B3	Dissolver coil
202A, B Cell	T-B2	Silver-reactor steam condensate
202A, A Cell	Tk-A3	Dissolver coil
202A, A Cell	T-A2	Silver-reactor steam condensate
	Miscellaneous waste sources (liquid drainage)	
202A, P&O	Mezzanine	Decontamination shower drain by east crane maintenance platform
202A Tunnels		Room drains from the railroad tunnel
202A		SCD alpha monitor flush
202A	Storage Basin	Fuel storage basin overflow and empty out
202A S. Side	Pump Pit 6	Drainage from SCD and CWL contributor piping leaks
202A S. Side	Pump Pit 7	Drainage from SCD and CWL contributor piping leaks

consists of dissolving the fuel and then separating the actinides using liquid-liquid solvent extraction. The driving forces for the separations consist of concentration changes, temperature changes, and chemical additions. The PUREX Plant is the source of five liquid effluent streams, which are mostly by-products of the various driving forces. These liquid effluent streams are the PDD, CWL, SCD, CSL, and ASD.

The concentration changes are provided by dilution with water and by removal of water (and sometimes nitric acid) by boiling. Cold chemical additions to the process add water, which must be removed in the concentration stages. Although most of the water, that is boiled out of solutions is reused in dilution stages, there is some excess water that requires disposal. This water is the source of the PDD, also known as Process Condensate. Addendum 12 addresses the PDD.

Boiling process solutions and condensing the resulting vapors requires the use of steam and cooling water, and produces steam condensate and warm water as effluents. Changing the temperatures of process solutions to drive the separations produces more steam condensate and warm water. This steam condensate and warm water constitutes most of the liquid effluents from PUREX, namely, the CWL (also known as Cooling Water), SCD (also known as Steam Condensate), and most of the CSL (also known as Chemical Sewer). Addenda 20 and 2 address the CWL and CSL, respectively.

Ventilation, heating, and water services, together with room drainage (mostly shower rooms, water coolers, housekeeping water, and steam and water leaks, together with occasional chemical leaks), contribute the remainder of the CSL.

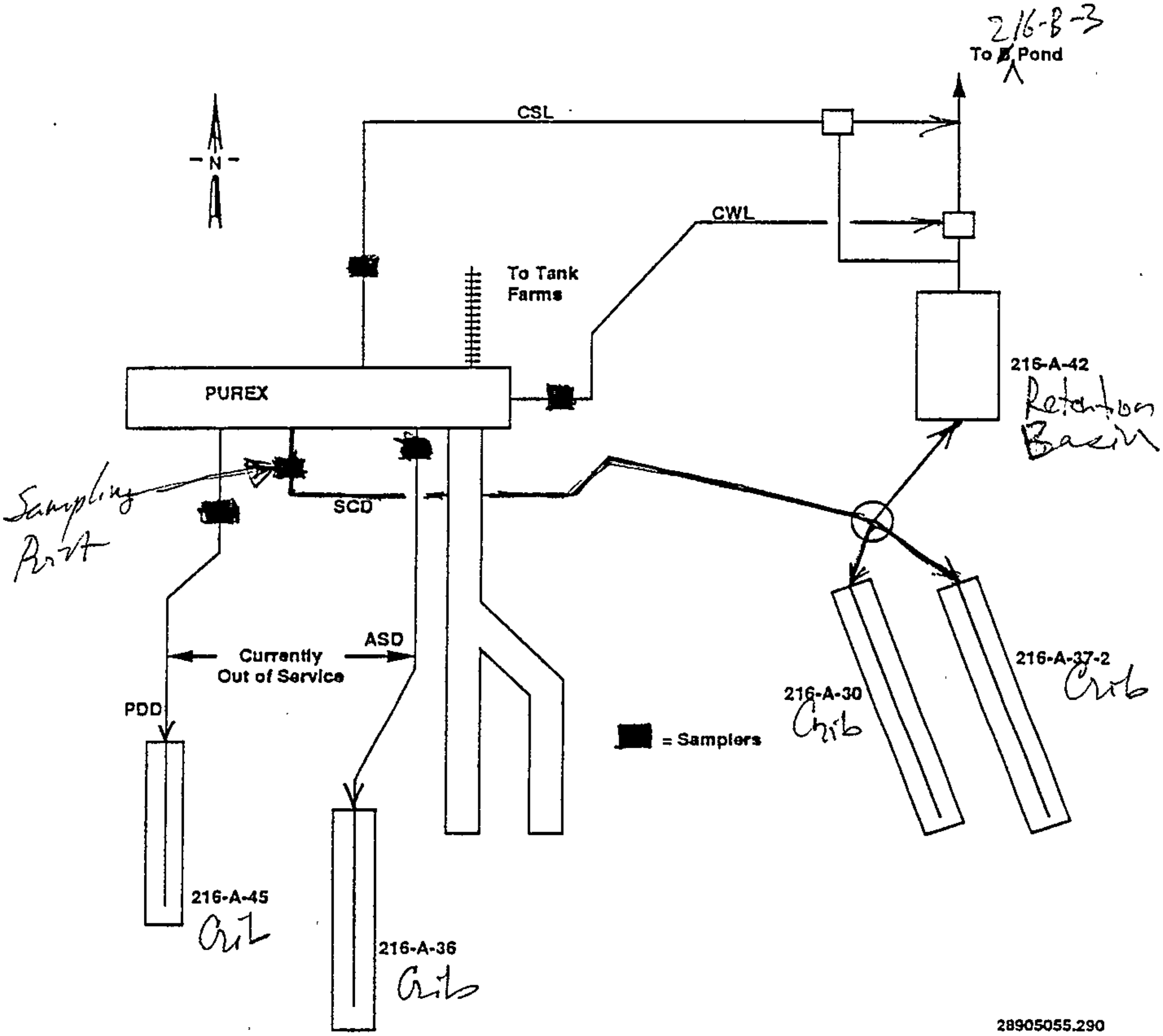
Removing the protective cladding from the fuel, the first step in fuel dissolution, produces large quantities of gaseous ammonia. This ammonia is scrubbed from the offgas with water to prevent releasing the ammonia to the air and to alleviate the explosion hazard that the ammonia would otherwise present. The resulting ammonia solution, contaminated with radionuclides from the fuel, is then boiled to remove the radionuclides. Before 1987, the resulting ammonia-bearing condensate stream was released as the ASD, also known as Ammonia Scrubber Condensate. In the future, with the implementation of the ammonia destruction process, this stream will consist of water with only traces of ammonia. The new ASD might be combined with the PDD, or it might be recycled to the ammonia scrubbers. Addendum 14 addresses the ASD.

Figure 2-3 shows the PUREX Plant liquid effluent system.

2.3.1.2 The Steam Condensate Process. The SCD consists almost entirely of warm raw water and condensed steam that has been used to control the temperature of certain process vessels. These vessels could experience heat transfer surface failure and radionuclide release. The process consists of routing the water or steam through a coil or tube bundle to heat or cool the process vessels.

The wastestream consists almost entirely of raw water (pumped from the Columbia River) and condensed steam, in varying proportions. Added to this mixture are (1) minute traces of radionuclides and chemical contaminants

Figure 2-3. The PUREX Plant Liquid Effluents.



deposited from the air onto jumpers (a remotely removable pipe) and nozzles when the jumpers are disconnected, (2) corrosion products from the piping used to conduct water from the Columbia River to the PUREX Plant, and, when tube failures occur, (3) elevated concentration of radionuclides arising from failure.

Figure 2-4 is a simplified schematic flow diagram for the SCD. The power plant steam and the raw cooling water contributors to the SCD enter the 202-A Building and flow through control valves to their penetrations of the north wall of the 202-A Canyon. The penetrations contain piping that conducts the heating and cooling fluids via jumpers (removable canyon pipe links) to their respective heat transfer surfaces. Process jumpers are typically constructed from stainless pipe and do not contribute to stream impurities. (Figures 2-5 and 2-6 are schematics of two typical types of heat transfer surfaces.) The heat exchange effluents then flow through penetrations in the south wall of the 202-A Canyon to an underground collection pipe, and finally to the 202-A-417 Caisson next to 295-AA in Figure 2-2. Equipment in the caisson includes transfer pumps, sample pump holdup tank, and a flow transmitter. When the level of liquid in the caisson reaches a predetermined level, it is pumped out through a flow meter to the 216-A-30 and 216-A-37-2 Cribs. Crib construction consists of a covered trench full of crushed stone with a liquid distribution header along its length (Figure 1-2). Table 2-2 lists the flows measured by the caisson flow meter for the current period. The same pump delivers a small flow past a volume proportional sampler, which is controlled from the flow meter. This sampler is the source of the samples used for creating the historical radiological data for the SCD. Figure 2-7 is a flow diagram for the SCD.

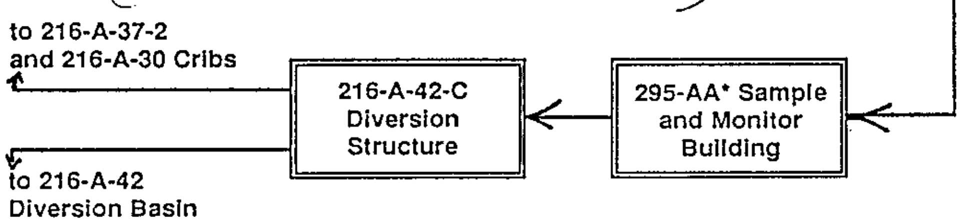
Table 2-2. Current Steam Condensate Flows.

Month/ Year	Flow (L/month)
October 1989	3.20 E+07
November 1989	3.70 E+07
December 1989	2.90 E+07
January 1990	5.40 E+07
February 1990	6.80 E+07
March 1990	3.72 E+07

A continuously running pump in the 202-A-417 Caisson transfers a sample stream of the SCD from the caisson to the 295-AA sample and monitor shack. Radiation detection instruments in the monitor shack continuously monitor the SCD and divert the effluent to the 216-A-42 Retention Basin whenever it exhibits above-normal radioactivity. If a flow diversion occurs because of an alarm on the effluent monitors, the basin is sampled and the results are transmitted to management and the effluents cognizant engineer. After reviewing the data, the isolated liquid is either recycled to the plant or released to the crib. Any probable chemical contamination would be from process solutions, which also contain detectable levels of radioactive contamination. Therefore, the chance of significant undetected chemical contamination is small.

Figure 2-4. Simplified Schematic Steam Condensate Flow Diagram.

E-J8	Concentrator Steam Condensate	(S) W
TK-J5	2A Feed Tank Coil	B
E-H4-1	Concentrator Steam Condensate	(S) W
TK-H1	HA Feed Tank Coil	B
TK-F16	High-Level Waste Tank Coil	B
TK-F15	Denitration Tank Coil	B
E-F11-1	Concentrator Steam Condensate	(S) W
TK-F8	Rework Tank Coil	B
E-F6	Concentrator Steam Condensate	(S) W
TK-E6	Solvent Extraction Feed Adjustment Tank Coil	W
TK-E1	Zirflex Actinide Recovery Tank Coil	W
TK-C3	Dissolver Coil	B
T-C2	Silver Reactor Steam Condensate	S
TK-B3	Dissolver Coil	B
T-B2	Silver Reactor Steam Condensate	S
TK-A3	Dissolver Coil	B
T-A2	Silver Reactor Steam Condensate	S
Storage Basin	Fuel Storage Basin Overflow and Emptyout	
P&O Mezzanine	Decontamination Shower Drain by	W
	East Crane Maintenance Platform	W
Tunnels	Room Drains from the Storage Tunnels	W
RR Tunnel	Room Drains in the Railroad Tunnel	W



* The SCD alpha scintillation detector flush originates in the 295-AA Building

Flow: S = Steam W = Water B = Both ( ) = Primary

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Figure 2-5. Tank Heating/Cooling Coil Schematic.

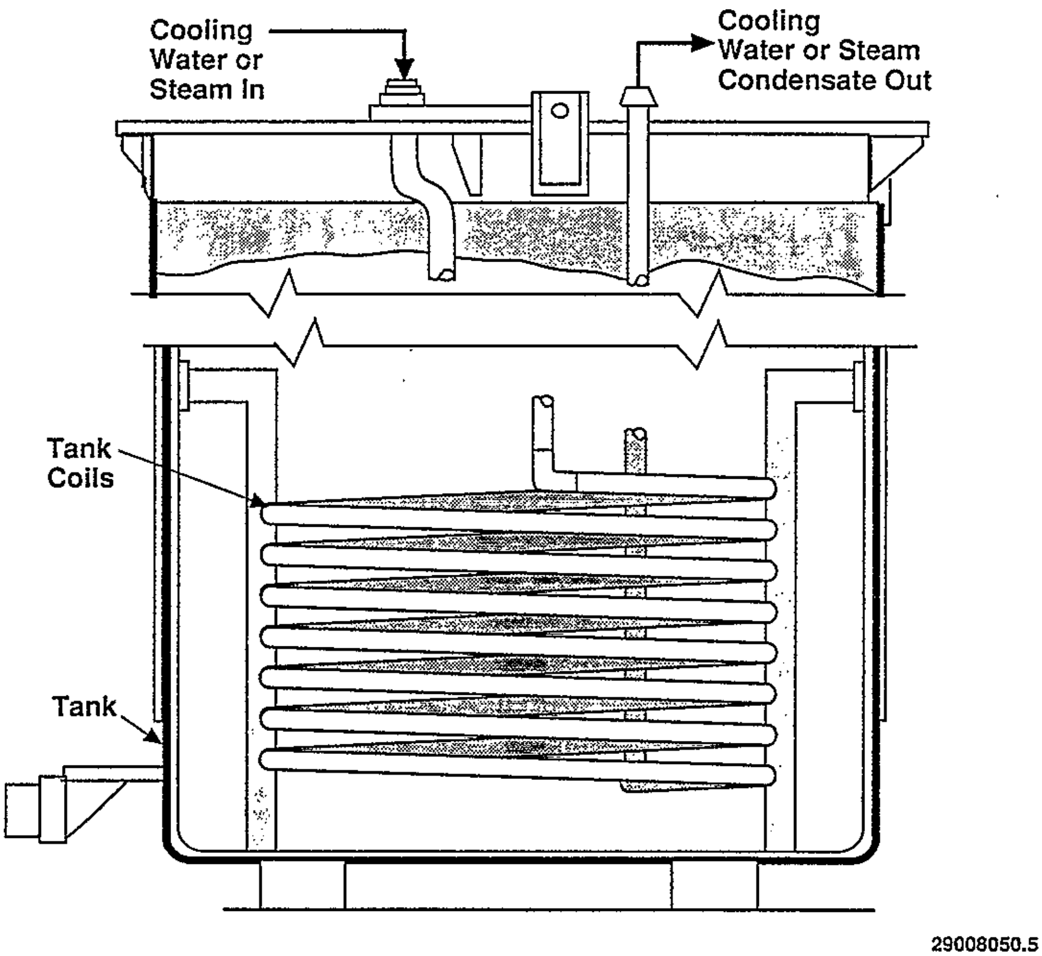


Figure 2-6. Typical Condenser Schematic.

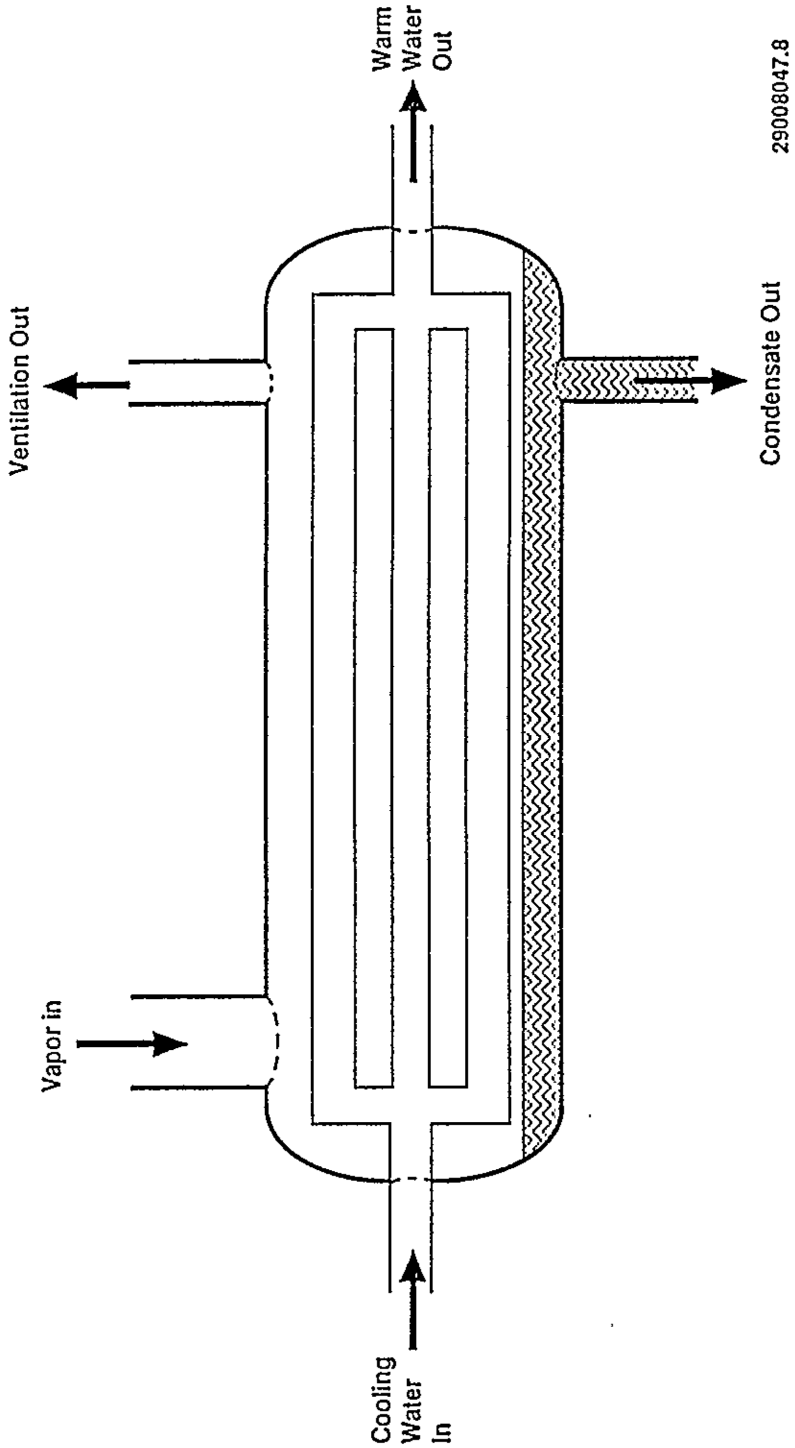
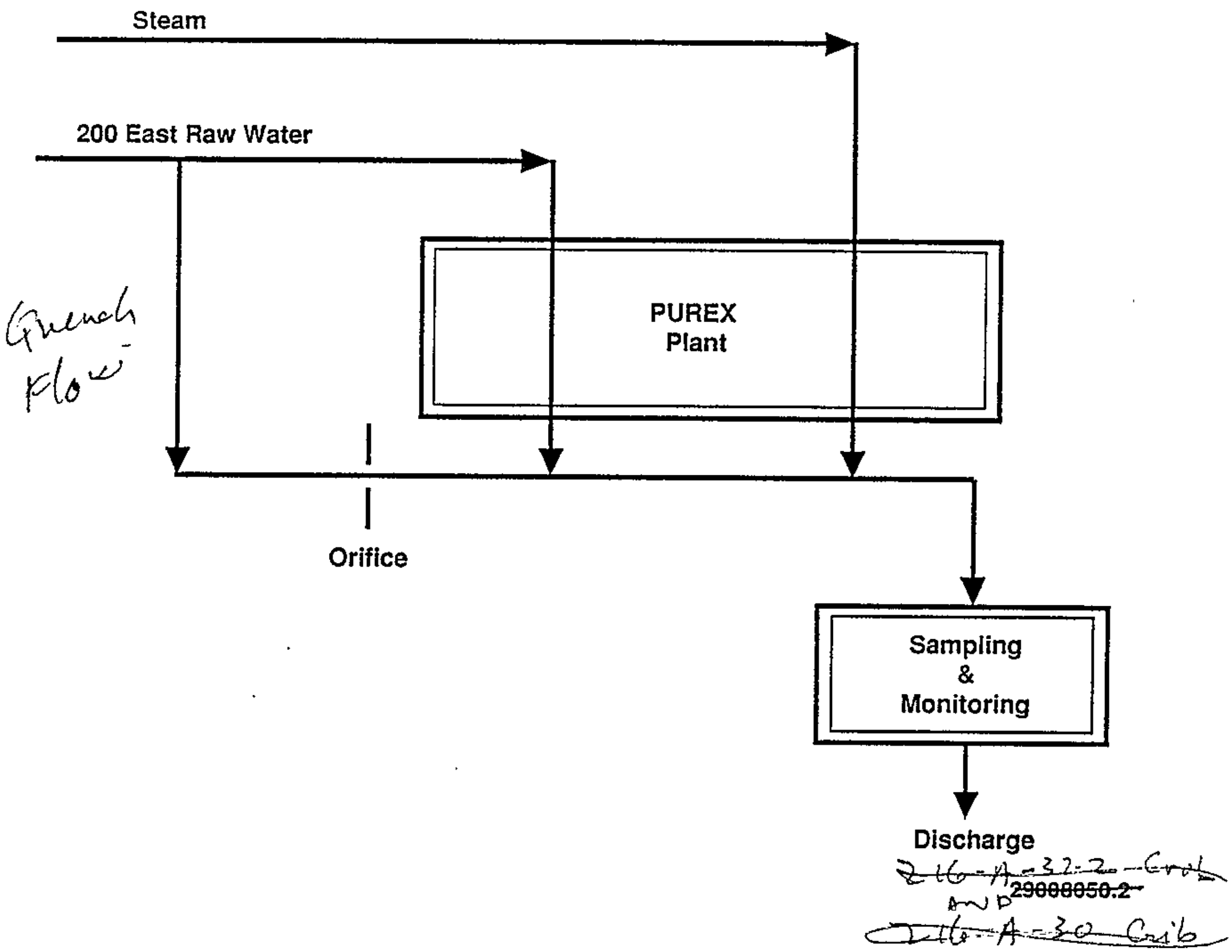


Figure 2-7. Steam Condensate Flow Diagram.



At the shack, the sample flows through two process control radiation monitors and past grab samplers that were used for the chemical samples of the SCD. One monitor is sensitive to alpha radiation and alarms if it detects 41 or more counts in a 1,000-s counting period. The other monitor is sensitive to gamma radiation and alarms if it exceeds 62,500 count/min. When either monitor alarms, it diverts the flow from the cribs to the 216-A-42 Retention Basin. Liquid effluents diverted to the retention basin are usually disposed either to the SCD cribs or the 216-B-3 Pond, depending on radionuclide sample results for the diverted effluent. The option also exists to send the basin contents back to the PUREX Plant for processing, if necessary.

In addition to the heating and cooling effluents, the SCD can also contain several miscellaneous wastes, including room drainage from the railroad tunnel (condensate, rainwater, or raw water added to wash down loose radioactive contamination), water from the fuel storage basin (no regular flow), effluent from a personnel-decontamination station (not normally used), and an occasional raw water flush of the alpha monitor that monitors radioactivity in the SCD.

The SCD normally flows into the 216-A-30 and 216-A-37-2 Cribs. Figure 2-8 illustrates a typical crib. Liquid effluents diverted to the retention basin are usually disposed either to these SCD cribs or to the 216-B-3 Pond, depending on sample results of radionuclide analyses for the diverted effluent. The option also exists for sending the basin contents back to the PUREX Plant for processing, if necessary.

2.3.1.3 Administrative Controls. Administrative controls have been enacted to implement the overall policy of conducting operations to meet the requirements, intent, and spirit of all applicable federal, state, and local environmental laws, regulations, and standards. A program of regulatory compliance based on the requirements of applicable environmental laws and input from appropriate regulatory agencies has been developed.

Since current technology does not exist for on-line (real-time) monitoring for all regulated materials, PUREX has incorporated administrative controls as an aid to prevent the release of hazardous material to the liquid effluent streams.

The administrative controls have general requirements that apply to all activities associated with regulated materials.

Training is a very important function of the administrative controls. General training courses are given to all employees, and specific training is given to employees working with regulated materials or in areas where they may come into contact with them. This training program includes annual refresher training.

A general requirement that acts as an important control is the system of frequent surveillances and inspections with the associated action findings and followup inspections. These are conducted on a regular basis and are supplemented with random surveillances.

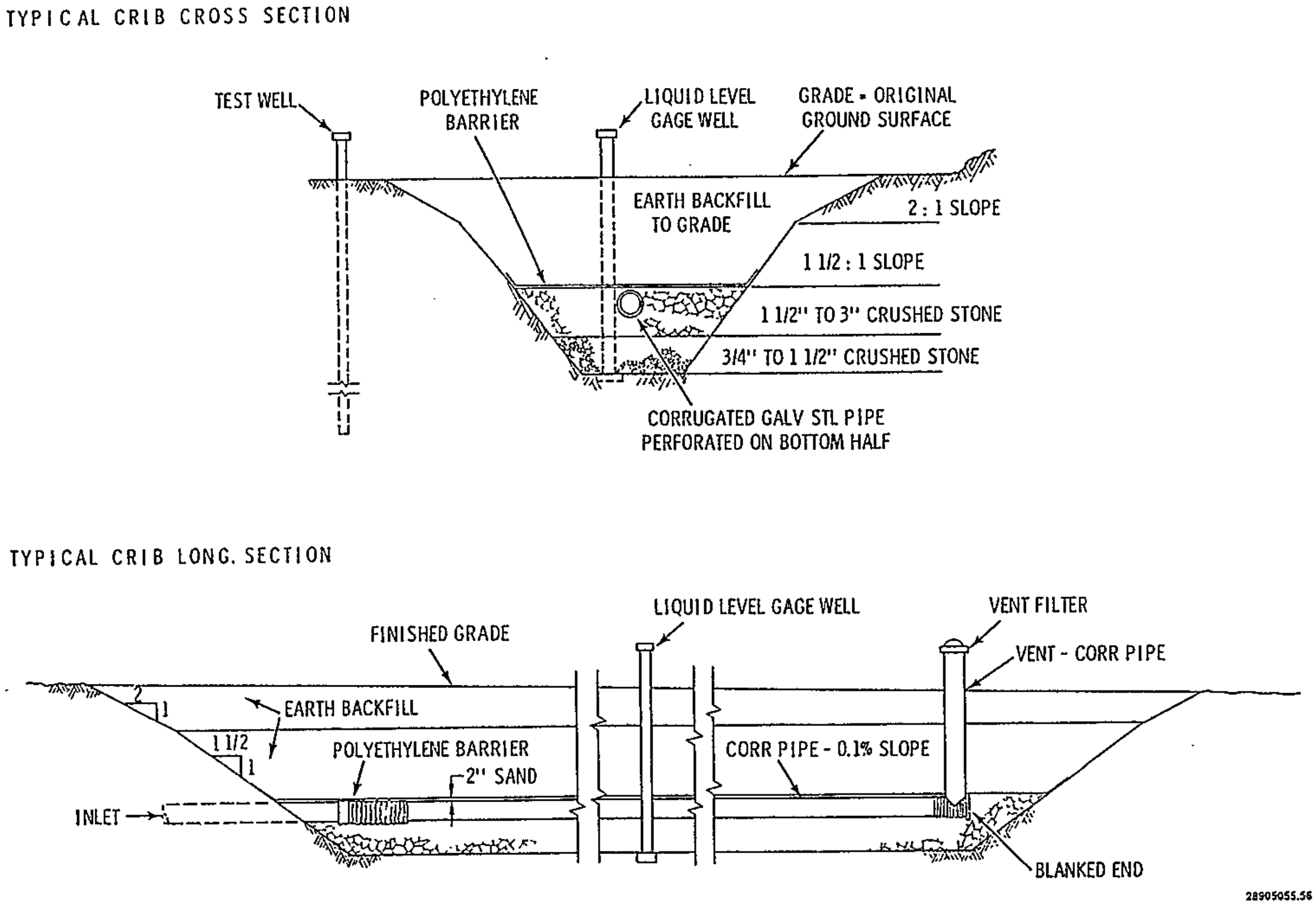


Figure 2-8. A Typical Crib.

Administrative controls for materials regulated by Ecology, the EPA, and the DOE have the clear goal of assuring that no regulated dangerous (hazardous) material is released into PUREX liquid effluent systems.

Specific activity control is maintained by the use of detailed, written procedures. These outline proper handling of materials as an aid to assure regulatory compliance. They are updated as needed when new regulatory requirements are mandated.

In terms of the management of sinks and drains, there are several stipulations. The most important one is that no dangerous (hazardous) waste shall be disposed of in drains.

There are also several requirements for the acquisition, storage, use and disposal of materials, They are to be physically controlled so that the risks of them entering the PUREX liquid effluent systems are minimized. This is achieved by placing them, wherever possible, at distances removed from entry points to the systems. Also, physical barriers such as closed doors and dams are used wherever possible.

2.3.2 Past Activities

Past activities cover the interval before October 1989. Past operations of the PUREX Plant SCD are similar to present operations.

Previously there have been pin-hole leaks in the heat transfer devices, which under transient conditions (i.e., startup or shutdown) allow small amounts of process fluids to enter the discharge header. Radiation and monitoring equipment will respond rapidly to releases of this kind. If leaks are suspected, the unit will be subsequently tested to verify if a breach exists. The necessary parts are replaced to terminate the release; however, low-levels of radionuclides will remain in the piping after the occurrence.

2.3.3 Future Activities

Future activities cover the interval after March 1990. Future changes applicable to the SCD effluent include a purification treatment process. A functional design criteria has been prepared as per Tri-Party Agreement Milestone M-17-00-T5 to comply with the June 1995 upgrade goal of the Tri-Party Agreement.

2.4 CONSTITUENTS

The PUREX Plant process does not introduce chemicals into the cooling water stream other than contamination that might inadvertently occur as the result of coil failure.

A corrosion inhibitor Super Filmeen* 14, added to the steam makeup water at the powerhouse, is the only product added to the Steam Condensate portion of the stream. This corrosion inhibitor contains both fatty amines and organic acids. The Material Safety Data Sheet (MSDS) for this product (reproduced in Appendix A) does not list chemical ingredients. The MSDS does, however, state that the product does not contain any EPA hazardous constituents.

The steam supply is made up of sanitary water that has been softened to remove minerals in a fashion similar to water softeners used in ordinary households. Sanitary water is Columbia River water that has been treated with small amounts of alum (aluminum sulfate) and chlorine for potability purposes.

Raw water is untreated Columbia River water that is used in cooling process vessels. Raw water may contribute some corrosion products from the piping used in its transport.

2.4.1 Estimated Concentrations

Steam condensate, cooling water, and miscellaneous drainage are the only contributors to the PUREX Plant SCD. No chemicals are intentionally added at the PUREX Plant to this stream. Chemicals expected to be detected in the SCD are those present in sanitary water, raw water, those contributed by the corrosion inhibitor, and those that might be contributed by slight corrosion of piping.

The only access to the SCD system is via the miscellaneous drains posted in Table 2-1. Administrative and physical controls are in place and are constantly being updated for plant activities concerning hazardous waste (Section 2.3.1.3). Drains discharging to the SCD include: East crane maintenance platform safety shower drain, storage tunnel entry room drains, SCD radiation monitor drains, fuel storage basin overflow and drain, Pump Pit 6 (202-A south side drainage from SCD and CWL), and Pump Pit 7 (drainage from SCD and CWL).

Procedures presently exist for disposal of hazardous materials. Most of these drains are in radiation control areas, and are not occupied without administrative controls, thus the probability of effluent release is low.

*Filmeen is a trademark of Dearborn, a division of C. W. Grace Co.

2.4.2 Variability

The major source of chemical constituents in the SCD is the raw water used in cooling process vessels. Depending on the time of year and processing status, the ratio of condensed steam to cooling water in the stream can vary from essentially cooling water to cooling water with a large percentage of condensed steam. Consequently, the concentrations of constituents introduced by the raw water and steam can vary considerably. These data have not been routinely collected as, historically, there has been no interest in these flows.

3.0 SAMPLE DATA

This section discusses the origin and history of the SCD samples. Since the source stream chemistry is important for comparison purposes, analyses for the 200 Area raw water and sanitary water are provided. The data presentation section provides a summary of the analytical methods and sample identification. A summary of the analytical results is presented along with statistical data for inorganic, organic, and radionuclide constituents.

3.1 DATA SOURCE

3.1.1 Wastestream Data

The chemical data for this report were obtained from six samples taken at the 295-AA Building, which houses equipment used to monitor and sample the SCD. Samples were taken between November 1989 and March 1990. The analyses were performed at the contract laboratory in Richland, Washington.

Sampling and analytical protocols followed are discussed in Section 3.0 of the "parent" document.

3.1.2 Background Data

Background data for chemicals are taken from samples of raw water, which is pumped from the Columbia River to the 282-E Reservoir.

3.2 DATA PRESENTATION

Table 3-1 presents the analyses performed, analytical method, and sample identification data for the SCD samples.

Analytical results along with statistical data are presented in Table 3-2. Column headings are explained in the footnotes. The new data set is presented in Appendix B and the historical data are presented in Appendix C.

Tables 3-3 and 3-4 show the raw and sanitary water data for the 200 East Area. They include both inorganic and organic data for use in background comparisons. Table 3-5 shows the composition of 2724-W Laundry steam condensate. Although the laundry steam condensate is not a source of material in the SCD, it should be similar to the steam fed to the SCD. There are no sample data available for PUREX condensed steam.

Table 3-1. Procedures for PUREX Steam Condensate Samples. (sheet 1 of 3)

LEAD#	50792	50883	50887	50899
C of C#	50792	50883	50887	50899
Alkalinity	X	X	X	X
Alpha counting	X	X	X	X
^{241}Am	X	X	X	X
Ammonia	X	X	X	X
Arsenic	X	X	X	X
Atomic emission spectroscopy	X	X	X	X
Beta counting	X	X	X	X
^{14}C	X		X	
Conductivity-field	X	X	X	X
Curium isotopes			X	X
Cyanide	X	X	X	X
Direct aqueous injection (GC)	X	X	X	X
Fluoride (LDL)	X	X	X	X
Gamma energy analysis	X	X	X	X
Hydrazine	X	X	X	X
Ion chromatography	X	X	X	X
Lead	X	X	X	X
Low-energy photon detection		X	X	X
Mercury	X	X	X	X
pH-field	X	X	X	X
Plutonium isotopes	X	X	X	X
Selenium	X	X	X	X
Semivolatile organics (GC/MS)	X	X	X	X
Strontium beta counting	X	X	X	X
Sulfide	X	X	X	X
Suspended solids	X	X	X	X
Temperature-field	X	X	X	X
Thallium	X	X	X	X
Total carbon	X	X	X	X
Total dissolved solids	X	X	X	X
Total organic carbon	X	X	X	X
Total organic halides (LDL)	X	X	X	X
Total radium alpha counting	X	X	X	X
Tritium	X	X	X	
Uranium	X	X	X	X
Uranium isotopes	X	X	X	X
Volatile organics (GC/MS)	X	X	X	X
LEAD#	50792B	50883B	50887B	50899B
C of C#	50793	50884	50888	50900
Volatile organics (GC/MS)	X	X	X	X
LEAD#	50883		50899T	
C of C#	50885		50901	
Volatile organics (GC/MS)	X		X	

Table 3-1. Procedures for PUREX Steam Condensate Samples. (sheet 2 of 3)

LEAD#	50792E	50883E	50887E	50899E
C of C#	50795	50886		50902
Atomic emission spectroscopy	X	X		X
Ignitability	X	X		X
Mercury (mixed matrix)	X	X		X
Reactive cyanide	X	X		X
Reactive sulfide	X	X		X

LEAD#	51016	51075
C of C#	51016	51075
Alkalinity	X	X
Alpha counting	X	X
^{241}Am	X	X
Ammonia	X	X
Arsenic	X	X
Atomic emission spectroscopy	X	X
Beta counting	X	X
^{14}C		X
Conductivity-field	X	X
Curium isotopes		
Cyanide	X	X
Direct aqueous injection (GC)	X	X
Fluoride (LDL)	X	X
Gamma energy analysis	X	X
Hydrazine	X	X
Ion chromatography	X	X
Lead	X	X
Low-energy photon detection		X
Mercury	X	X
pH-field	X	X
Plutonium isotopes	X	X
Selenium	X	X
Semivolatile organics (GC/MS)	X	X
Strontium beta counting	X	X
Sulfide	X	X
Suspended solids	X	X
Temperature-field	X	X
Thallium	X	X
Total carbon	X	X
Total dissolved solids	X	X
Total organic carbon	X	X
Total organic halides (LDL)	X	X
Total radium alpha counting	X	X
Tritium	X	X
Uranium	X	X
Uranium isotopes	X	X
Volatile organics (GC/MS)	X	X

Table 3-1. Procedures for PUREX Steam Condensate Samples. (sheet 3 of 3)

LEAD#	51016B	51075B
C of C#	51017	51076
Volatile organics (GC/MS)	X	X
LEAD#	51016T	51075T
C of C#	51018	51077
Curium isotopes		X
Volatile organics (GC/MS)	X	X
LEAD#	51016E	51075
C of C#	51019	51078
Atomic emission spectroscopy	X	X
Ignitability	X	X
Mercury (mixed matrix)	X	X
Reactive cyanide	X	X
Reactive sulfide	X	X

NOTES: Procedures that were performed for a given sample are identified by an "X". Procedure references appear with the data.

LEAD# is the Liquid Effluent Analytical Data number that appears in the data reports. C of C# is the chain-of-custody number.

Abbreviations:

GC = gas chromatography.
LDL = low-detection limit.
MS = mass spectrometry.

Table 3-2. Statistics for PUREX Steam Condensate. (sheet 1 of 2)

Constituent	N	MDA	Method	Mean	StdErr	90%CILim	Maximum
Arsenic (EP Toxic)	6	6	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Barium	6	0	n/a	2.82E+01	9.10E-01	2.95E+01	3.00E+01
Barium (EP Toxic)	6	6	n/a	<1.00E+03	0.00E+00	<1.00E+03	<1.00E+03
Boron	6	3	DL	1.75E+01	4.18E+00	2.37E+01	3.20E+01
Cadmium (EP Toxic)	6	6	n/a	<1.00E+02	2.79E-06	<1.00E+02	<1.00E+02
Calcium	6	0	n/a	1.72E+04	4.92E+02	1.79E+04	1.81E+04
Chloride	6	0	n/a	9.50E+02	5.63E+01	1.03E+03	1.10E+03
Chromium (EP Toxic)	6	6	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Fluoride	6	0	n/a	1.18E+02	3.61E+00	1.23E+02	1.36E+02
Iron	6	3	DL	3.13E+01	6.15E-01	3.22E+01	3.30E+01
Lead (EP Toxic)	6	6	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Magnesium	6	0	n/a	4.07E+03	1.23E+02	4.25E+03	4.49E+03
Mercury (EP Toxic)	6	6	n/a	<2.00E+01	6.96E-07	<2.00E+01	<2.00E+01
Nitrate	6	2	LM	5.46E+02	2.47E+01	5.82E+02	6.00E+02
Potassium	6	0	n/a	6.82E+02	2.08E+01	7.13E+02	7.45E+02
Selenium (EP Toxic)	6	6	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Silicon	6	0	n/a	2.21E+03	7.06E+01	2.32E+03	2.35E+03
Silver (EP Toxic)	6	6	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Sodium	6	0	n/a	1.98E+03	4.65E+01	2.05E+03	2.07E+03
Strontium	6	0	n/a	8.33E+01	2.85E+00	8.75E+01	9.60E+01
Sulfate	6	0	n/a	9.47E+03	2.20E+02	9.79E+03	1.02E+04
Uranium	6	0	n/a	5.25E-01	2.92E-02	5.68E-01	6.11E-01
Zinc	6	4	DL	5.33E+00	2.11E-01	5.64E+00	6.00E+00
Acetone	6	5	DL	1.00E+01	3.48E-07	1.00E+01	1.00E+01
1-Butanol	1	0	n/a	2.40E+01	n/a	n/a	2.40E+01
Tributylphosphate	5	4	DL	1.08E+01	8.00E-01	1.20E+01	1.40E+01
Alkalinity (Method B)	6	0	n/a	5.52E+04	1.66E+03	5.76E+04	5.80E+04
Alpha Activity (pCi/L)	6	0	n/a	5.38E+00	1.21E+00	7.17E+00	9.92E+00
Beta Activity (pCi/L)	6	0	n/a	1.59E+02	4.40E+01	2.24E+02	3.04E+02
Conductivity (μS)	6	0	n/a	1.39E+02	4.74E+00	1.46E+02	1.51E+02
Ignitability (°F)	6	0	n/a	2.10E+02	9.55E-01	2.09E+02	2.06E+02
pH (dimensionless)	6	0	n/a	7.53E+00	1.25E-01	7.71E+00	8.09E+00
Reactivity Cyanide (mg/kg)	6	6	n/a	<1.00E+02	2.79E-06	<1.00E+02	<1.00E+02
Reactivity Sulfide (mg/kg)	6	6	n/a	<1.00E+02	2.79E-06	<1.00E+02	<1.00E+02
TDS	6	0	n/a	6.25E+04	2.55E+03	6.63E+04	7.40E+04
Temperature (°C)	6	0	n/a	1.93E+01	1.87E+00	2.21E+01	2.37E+01
TOC	5	4	DL	1.02E+03	4.90E+01	1.10E+03	1.20E+03
Total Carbon	6	0	n/a	1.36E+04	6.31E+02	1.46E+04	1.59E+04
TOX (as Cl)	6	5	DL	6.17E+00	1.25E+00	8.01E+00	1.20E+01
^{241}Am (pCi/L)	6	0	n/a	5.39E-01	2.24E-01	8.70E-01	1.60E+00
^{144}Ce/Pr	5	0	n/a	2.22E+02	7.49E+01	3.37E+02	4.69E+02
^{137}Cs# (pCi/L)	6	1	DL	1.02E+01	3.84E+00	1.59E+01	2.20E+01
^{238}Pu (pCi/L)	6	0	n/a	4.26E-01	8.54E-02	5.52E-01	7.60E-01
^{239,240}Pu (pCi/L)	6	0	n/a	5.49E+00	1.14E+00	7.17E+00	9.88E+00

Table 3-2. Statistics for PUREX Steam Condensate. (sheet 2 of 2)

Constituent	N	MDA	Method	Mean	StdErr	90%CILim	Maximum
Radium Total (pCi/L)	6	0	n/a	2.01E+00	1.60E+00	4.38E+00	1.00E+01
^{90}Sr (pCi/L)	6	1	DL	1.76E+00	1.06E+00	3.32E+00	6.99E+00
^{234}U (pCi/L)	6	0	n/a	2.34E-01	2.05E-02	2.64E-01	2.99E-01
^{238}U (pCi/L)	6	0	n/a	1.57E-01	1.44E-02	1.78E-01	1.92E-01

NOTES: Mean values, standard errors, confidence interval limits and maxima are in ppb (parts per billion) unless indicated otherwise.

The column headed MDA (Minimum Detectable Amount) is the number of results in each data set below the detection limit.

The column headed Method shows the MDA replacement method used: replacement by the detection limit (DL), replacement of single-valued MDAs by the log-normal plotting position method (LM), or replacement of multiple valued MDAs by the normal plotting position method (MR).

The column headed "90%CILim" (90% Confidence Interval Limit) is the lower limit of the one-tailed 90% confidence interval for all ignitability data sets and pH data sets with mean values below 7.25. For all other data sets it is the upper limit of the one-tailed 90% confidence interval.

The column headed "Maximum" is the minimum value in the data set for ignitability, the value furthest from 7.25 for pH, and the maximum value for all other analytes.

# Denotes an ill-conditioned data set, i.e., one in which at least one reported measurement is less than at least one reported detection limit.

Table 3-3. Summary of 200 East Area Raw Water Data (1986-1987).

Constituent/Parameter [all ppb, exceptions noted]	Raw Water[a] (1986-1987)			Sanitary Water[b] (1985-1988)		
	N[c]	AVG	STD DEV	N	AVG	STD DEV
Arsenic				4	<5.00E+00	NA
Barium	5	2.80E+01	3.40E+00	4	*1.05E+02	1.00E+01
Cadmium	5	2.40E+00	8.94E-01	4	<5.00E-01	NA
Calcium	5	1.84E+04	1.47E+03			
Chromium				4	<1.00E+01	NA
Chloride	5	8.71E+02	2.37E+02	4	3.05E+03	6.76E+02
Conductivity-field (μS)	5	9.32E+01	4.61E+01			
Copper	5	1.06E+01	1.34E+00	4	*2.50E+01	1.00E+01
Color (units)				4	<5.00E+00	NA
Iron	5	6.36E+01	2.57E+01	4	*8.25E+01	5.19E+01
Fluoride				4	*1.13E+02	2.50E+01
Lead				4	<5.00E+00	NA
Magnesium	5	4.19E+03	4.83E+02			
Manganese	5	9.80E+00	3.49E+00	4	<1.00E+01	NA
Mercury				4	<5.00E-01	NA
Nickel	5	1.04E+01	8.94E-01			
Nitrate (as N)	5	9.96E+02	8.79E+02	4	*3.72E+02	5.44E+02
pH (dimensionless)	5	7.41E+00	1.18E+00			
Potassium	5	7.95E+02	6.24E+01			
Selenium				4	<5.00E+00	NA
Silver				4	<1.00E+01	NA
Sodium	5	2.26E+03	2.42E+02	4	2.28E+03	1.26E+02
Sulfate	5	1.06E+04	9.97E+02	4	1.68E+04	3.37E+03
Temperature-field (°C)	5	1.64E+01	5.84E+00			
TOC (μg/g)	5	1.36E+03	2.53E+02			
TDS (mg/L)				4	8.10E+01	1.69E+01
Trichloromethane	5	1.18E+01	4.02E+00			
Uranium	4	7.26E-01	2.22E-01			
Zinc	5	2.00E+01	2.12E+01	4	<1.00E+02	NA
Radionuclides (pCi/L)						
Alpha Activity	4	8.85E-01	5.30E-01			
Beta Activity	4	4.47E+00	1.76E+00			

NOTES: Averages denoted by an asterisk include a mix of above- and below-detection limit in computations when the actual values are below the detection limit.

See companion table for inorganic detection limits as compiled from Hanford Environmental Health Foundation.

[a]Compiled from "Substance Toxicity Evaluation of Waste Data Base," provided by F. M. Jungfleisch (this data is an update of the data presented in Preliminary Evaluation of Hanford Liquid Discharges to Ground, Westinghouse Hanford Company (Jungfleisch 1988).

[b]Compiled from Hanford Sanitary Water Quality Surveillance, for calendar years 1985, 1986, 1987, and 1988 (Somers 1986, 1987, 1988, 1989).

[c]N is defined as the number of test results available for a particular analyte. N may reflect both single and multiple data sets.

ppb = parts per billion.
pCi/L = picoCuries/liter.
TOC = total organic carbon.
TOX = total organic halides.
TDS = Total Dissolved Solids.
μS = microsiemen.
μg = microgram.

Table 3-4. 200 East Sanitary Water--Organic Data (1987-1988).

Constituent/Parameter [all ppb, exceptions noted]	200 East[a]		
	N[b]	AVG	STD DEV
1,1,1-Trichloroethane	1	<DL[c]	NA
1,1 Dichloroethylene	1	<DL	NA
1,2,-Dichloroethane	1	<DL	NA
1,3,5-Trimethylbenzene	1	<DL	NA
Benzene	1	<DL	NA
Bromodichloromethane	5	1.76E+00	6.68E-01
Bromoform	5	<DL	NA
Carbon Tetrachloride	1	<DL	NA
Chlorodibromomethane	5	<DL	NA
Chloroform	5	2.65E+01	1.27E+01
Difluorodichloromethane	2	<DL	NA
Ethlylbenzene	1	<DL	NA
o-Xylene	1	<DL	NA
p-Chlorotoluene	1	<DL	NA
p-Dichlorobenzene	1	<DL	NA
Tetrachloroethylene	1	<DL	NA
Toluene	1	<DL	NA
Trichloroethylene	1	<DL	NA
Vinyl Chloride	1	<DL	NA

[a]The data given in this table were compiled by Hanford Environmental Health Foundation (HEHF). Data sets included first quarter 1987 and quarterly 1988 data. The total trihalomethane concentration for the 200 and 300 Areas appear in the *Hanford Sanitary Water Quality Surveillance Report for CY 1988* (Somers 1989) and the *Hanford Sanitary Water Quality Surveillance Report for CY 1989* (Thurman 1990).

[b]N is defined as the number of test results available for a particular analyte; N may reflect both single and multiple data sets. For N = 1 the sole available data entry is listed as "avg."

[c]See companion table for organic detection limits as compiled from HEHF data.

DL = detection limit.

ppb = parts per billion.

Table 3-5. Summary of 2724-W Laundry Steam Condensate Data. (sheet 1 of 2)

Constituent/Parameter [all ppb, exceptions noted	2724-W Laundry Steam Condensate[a] (1989) N[b]	AVG	STD DEV
Acetone	4	1.10E+01	1.73E+00
Alkalinity (Method B)	4	2.95E+04	1.01E+04
Aluminum	4	5.63E+02	6.86E+02
Ammonia	4	6.92E+01	1.19E+01
Arsenic (EP Toxic)	4	<5.00E+02	0.00E+00
Barium	4	1.80E+01	8.92E+00
Barium (EP Toxic)	4	<1.00E+03	0.00E+00
Boron	4	2.30E+01	8.52E+00
1-Butanol	1	3.90E+01	
Cadmium	4	<2.00E+00	0.00E+00
Cadmium (EP Toxic)	4	<1.00E+02	0.00E+00
Calcium	4	7.65E+03	6.43E+03
Chromium (EP Toxic)	4	<5.00E+02	0.00E+00
Chloride	4	1.35E+03	8.61E+02
Conductivity-field (µS)	4	6.32E+01	5.39E+01
Copper	4	8.17E+02	6.11E+02
Ignitability (°F)	4	2.06E+02	4.76E+00
Iron	4	2.06E+03	2.48E+03
Fluoride	4	7.50E+01	
Lead	4	1.55E+01	7.72E+00
Lead (EP Toxic)	4	<5.00E+02	0.00E+00
Magnesium	4	1.82E+03	1.39E+01
Manganese	4	1.57E+01	1.59E+01
Mercury (EP Toxic)	4	<2.00E+01	0.00E+00
pH (dimensionless)	4	6.98E+00	8.42E-01
Potassium	4	3.27E+02	1.94E+02
Reactivity Cyanide (mg/kg)	4	<1.00E+02	0.00E+00
Reactivity Sulfide (mg/kg)	4	<1.00E+02	0.00E+00
Selenium (EP Toxic)	4	<5.00E+02	0.00E+00
Silicon	4	1.75E+03	8.49E+02
Silver (EP Toxic)	4	<5.00E+02	0.00E+00
Sodium	4	8.85E+02	6.15E+02
Strontium	4	3.92E+01	3.15E+01
Sulfate	4	5.50E+03	4.88E+03
Suspended Solids (mg/L)	4	2.02E+04	1.61E+03
Temperature-field (°C)	4	6.63E+01	8.66E+00
Titanium	4	8.75E+01	4.76E+01
Total Carbon (µg/g)	4	4.53E+03	2.77E+03
TOX (µg (Cl)/L)	4	2.52E+01	2.79E+01
TDS (mg/L)	4	2.70E+04	2.25E+04
Trichloromethane	4	1.17E+01	1.17E+01
Uranium	3	3.45E-01	1.43E-01
Zinc	4	3.02E+01	2.44E+01

Table 3-5. Summary of 2724-W Laundry Steam Condensate Data. (sheet 2 of 2)

Constituent/Parameter [all ppb, exceptions noted	2724-W Laundry Steam Condensate[a] (1989) N[b]	AVG	STD DEV
Radionuclides (pCi/L)			
^{241}Am	2	5.77E-03	1.66E-03
^{60}Co	3	7.13E-01	3.14E-01
^{137}Cs	3	1.80E+00	1.21E+00
^{129}I	3	1.19E-01	6.94E-02
^{238}Pu	2	1.57E-03	1.27E-03
^{239}Pu	4	7.82E-03	6.27E-03
^{90}Sr	4	1.80E-01	1.60E-01
^{234}U	4	8.90E-02	6.65E-02
^{235}U	3	1.43E-02	7.13E-03
^{238}U	3	9.39E-02	2.16E-02

[a]Data from sampling campaign conducted October 1, 1989, to March 30, 1990 in support of Stream Specific Reports.

[b]N is defined as the number of test results available for a particular analyte. N may reflect both single and multiple data sets.

ABBREVIATIONS:

ppb = parts per billion.
μS = microSiemens.
μg = micrograms.
TOC = Total Organic Carbon.
TOX = Total Organic Halides.
TDS = Total Dissolved Solids.
pCi/L = picocuries per liter.

4.0 DATA OVERVIEW

This section compares the SCD sampling data set with the background (see Section 3.0), and with drinking water standards and derived concentration guides. This also provides estimates of radionuclide and chemical deposition rates for the SCD.

4.1 DATA COMPARISON

Table 4-1 compares PUREX SCD constituent concentrations with EPA drinking water standards (SV1) and DOE derived concentration guides (SV2). The table provides a comparison of average constituent concentrations to various screening criteria. These criteria are not used here for compliance purposes.

Table 4-2 compares the SCD constituent concentrations to background values in the raw water and laundry steam.

Process knowledge indicates that the steam condensate should be similar to the raw water background, because no chemicals are added to the stream with the exception of the corrosion inhibitor, which has been added to the SCD component. Indeed, water softening may remove some of the constituents of raw water.

Concentration data given in Tables 4-1 and 4-2 indicate that inorganic constituents are similar to raw water concentrations and are less than DWS posted limits. Alpha and beta total values are lower than DWS values but are greater than raw water background. This is because of past equipment failures. Radionuclide concentrations are less than the posted DWS limits in all cases.

4.2 STREAM DEPOSITION RATES

Table 4-3 shows estimates of SCD constituent deposition (kilograms per month) based on the PUREX Plant flow data and average stream concentrations.

Table 4-1. Evaluation of PUREX Steam Condensate.

Constituent	Result[a]	SV1[b]	SV2[c]
Barium	2.8E-02	5.0E+00 g	
Chloride	9.5E-01	2.5E+02 h	
Fluoride	1.2E-01	2.0E+00 g	
Iron	3.1E-02	3.0E-01 h	
Nitrate	5.5E-01	4.5E+01 e	
Sulfate	9.5E+00	2.5E+02 h	
Zinc	5.3E-03	5.0E+00 h	
Alpha Activity (pCi/L)[n]	5.4E+00	1.5E+01 g	3.0E+01
^{241}Am (pCi/L)	5.4E-01	4.0E+00 e	3.0E+01
Beta Activity (pCi/L)	1.6E+02		1.0E+03
^{144}Ce/Pr (pCi/L)	2.2E+02		7.0E+03
^{137}Cs (pCi/L)[d]	1.0E+01	1.0E+02 e	3.0E+03
^{238}Pu (pCi/L)	4.3E-01		4.0E+01
^{239,240}Pu (pCi/L)[l]	5.5E+00	4.0E+01 e	3.0E+01
^{90}Sr (pCi/L)[d]	1.8E+00	5.0E+01 e	1.0E+03
^{234}U (pCi/L)	2.3E-01		5.0E+02
^{238}U (pCi/L)	1.6E-01		6.0E+02
TDS	6.2E+01	5.0E+02 h	

NOTES: [a]Units of results are mg/L unless indicated otherwise. The results are the mean values reported in the Statistics table of Section 3.0.

[b]Screening Value 1 (SV1) lists the value first, basis second and an asterisk (*) third if the result exceeds the regulatory value. The basis is the proposed primary MCL (e), the proposed secondary MCL (f), the primary MCL (g), or the secondary MCL (h). The value is the smaller of two MCLs: the proposed primary MCL (or the primary MCL as a default) or the proposed secondary MCL (or the secondary MCL as a default). See WHC-EP-0342, "Hanford Site Stream-Specific Reports," August 1990.

[c]Screening Value 2 (SV2) lists the value first and an asterisk (*) second if the result exceeds the SV2). These values are derived concentration guides obtained from Appendix A of WHC-CM-7-5, "Environmental Compliance Manual," Revision 1, January 1990.

[d]Constituents are identified (d) if any detected result is less than any detection limit.

[l]The SV1 value for ^{239}Pu is used to evaluate ^{239,240}Pu.

[n]The SV1 and SV2 values for Gross Alpha are used to evaluate Alpha Activity.

[o]The SV2 for Gross Beta is used to evaluate Beta Activity.

Table 4-2. Comparison of SCD to Raw Water and Steam Condensate.

Constituent	PUREX SCD stream	200 East raw water	Laundry steam condensate
Arsenic (EP Toxic)	<5.00E+02		<5.00E+02
Barium	2.82E+01	2.80E+01	1.80E+01
Boron	1.75E+01		2.30E+01
Cadmium (EP Toxic)	<1.00E+02	2.40E+00	<2.00E+00
Calcium	1.72E+04	1.84E+04	7.65E+03
Chloride	9.50E+02	8.71E+02	1.35E+03
Chromium (EP Toxic)	<5.00E+02		<5.00E+02
Fluoride	1.18E+02		7.50E+01
Iron	3.13E+01	6.36E+01	2.06E+03
Lead (EP Toxic)	<5.00E+02		1.55E+01
Magnesium	4.07E+03	4.19E+03	1.82E+03
Mercury (EP Toxic)	<2.00E+01		<2.00E+01
Nitrate	5.46E+02	9.96E+02	
Potassium	6.82E+02	7.95E+02	3.27E+02
Selenium (EP Toxic)	<5.00E+02		<5.00E+02
Silicon	2.21E+03		1.75E+03
Silver (EP Toxic)	<5.00E+02		<5.00E+02
Sodium	1.98E+03	2.26E+03	8.85E+02
Strontium	8.33E+01		3.92E+01
Sulfate	9.47E+03	1.06E+04	5.50E+03
Uranium	5.25E-01	7.26E-01	3.45E-01
Zinc	5.33E+00	2.00E+01	3.02E+01
Acetone	1.00E+01		1.10E+01
1-Butanol	2.40E+01		3.90E+01
Tributylphosphate	1.08E+01		
Alkalinity (Method B)	5.52E+04		2.95E+04
Alpha Activity (pCi/L)	5.38E+00	8.85E-01	
Beta Activity (pCi/L)	1.59E+02	4.47E+00	
Conductivity (μS)	1.39E+02	9.32E+01	6.32E+01
Ignitability (°F)	2.10E+02		2.06E+02
pH (dimensionless)	7.53E+00	7.41E+00	6.98E+00
Reactivity Cyanide (mg/kg)	<1.00E+02		<1.00E+02
Reactivity Sulfide (mg/kg)	<1.00E+02		<1.00E+02
TDS (mg/L)	6.25E+04		2.70E+04
Temperature (°C)	1.93E+01	1.64E+01	6.63E+01
TOC (mg/kg)	1.02E+03	1.36E+03	
Total Carbon (mg/kg)	1.36E+04		4.53E+03
TOX (ng (Cl)/ml)	6.17E+00		2.52E+01
Unidentified Constituent	2.22E+02		
^{241}Am (pCi/L)	5.39E-01		5.77E-03
^{137}Cs (pCi/L)	1.02E+01		1.80E+00
^{238}Pu (pCi/L)	4.26E-01		1.57E-03
^{239,240}Pu (pCi/L)	5.49E+00		
^{239}Pu			7.82E-03
Radium Total (pCi/L)	2.01E+00		
^{90}Sr (pCi/L)	1.76E+00		1.80E-01
^{234}U (pCi/L)	2.34E-01		8.90E-02
^{238}U (pCi/L)	1.57E-01		9.39E-02

Table 4-3. Deposition Rate for PUREX Steam Condensate.
Flowrate: 4.29E+07 L/mo.

Constituent	Kg/L*	Kg/mo*
Barium	2.82E-08	1.21E+00
Boron	1.75E-08	7.50E-01
Calcium	1.72E-05	7.37E+02
Chloride	9.50E-07	4.07E+01
Fluoride	1.18E-07	5.06E+00
Iron	3.13E-08	1.34E+00
Magnesium	4.07E-06	1.74E+02
Nitrate	5.46E-07	2.34E+01
Potassium	6.82E-07	2.92E+01
Silicon	2.21E-06	9.47E+01
Sodium	1.98E-06	8.49E+01
Strontium	8.33E-08	3.57E+00
Sulfate	9.47E-06	4.06E+02
Uranium	5.25E-10	2.25E-02
Zinc	5.33E-09	2.28E-01
Acetone	1.00E-08	4.29E-01
1-Butanol	2.40E-08	1.03E+00
Tributylphosphate	1.08E-08	4.63E-01
Alpha Activity *	5.38E-12	2.31E-04
Beta Activity *	1.59E-10	6.82E-03
TDS	6.25E-05	2.68E+03
TOC	1.02E-06	4.37E+01
Total Carbon	1.36E-05	5.83E+02
TOX (as Cl)	6.17E-09	2.64E-01
Unidentified constituent	2.22E-07	9.52E+00
^{241}Am *	5.39E-13	2.31E-05
^{144}Ce/Pr *	2.20E-10	9.43E-03
^{137}Cs #,*	1.02E-11	4.37E-04
^{238}Pu *	4.26E-13	1.83E-05
^{239,240}Pu *	5.49E-12	2.35E-04
Radium Total *	2.01E-12	8.62E-05
^{90}Sr # *	1.76E-12	7.54E-05
^{234}U *	2.34E-13	1.00E-05
^{238}U *	1.57E-13	6.73E-06

NOTE: Data collected from October 1989 through March 1990. Flow rate is the average of rates from Section 2.0. Constituent concentrations are average values from the Statistics Report in Section 3.0. Concentration units of flagged (*) constituents are reported as curies per liter. Deposition rate units of flagged (*) constituents are reported as curies per month. Constituents are flagged (#) if any detected result is less than any detection limit.

5.0 DESIGNATION

This section proposes that the PUREX Plant SCD not be designated a dangerous waste. This proposed designation uses data from both the effluent source description and sample data (Sections 2.0 through 4.0) and complies with the designation requirements of WAC 173-303-070 (Ecology 1989).

The *Dangerous Waste Regulations* (WAC 173-303-070) contain the procedure for determining if a waste is dangerous. This procedure is illustrated in Figure 5-1.

The designation process involves two methods. Process knowledge, such as the sources of the stream, all additions to the stream, and pathway, is reviewed. Sample data are also incorporated to check for potential or existing listed dangerous waste components covered in WAC 173-303-080 through WAC 173-303-083.

A separate method is used for "criteria" dangerous wastes in WAC 173-303-100 and "characteristic" wastes in WAC 173-303-090. Broad spectrum chemical analyses are compiled and compared with the limiting conditions given in WAC 173-303-100 and -90. If the effluent discharge rates and/or concentrations are below the posted limits then the stream is not designated a dangerous waste or extremely hazardous waste.

5.1 DANGEROUS WASTE LISTS

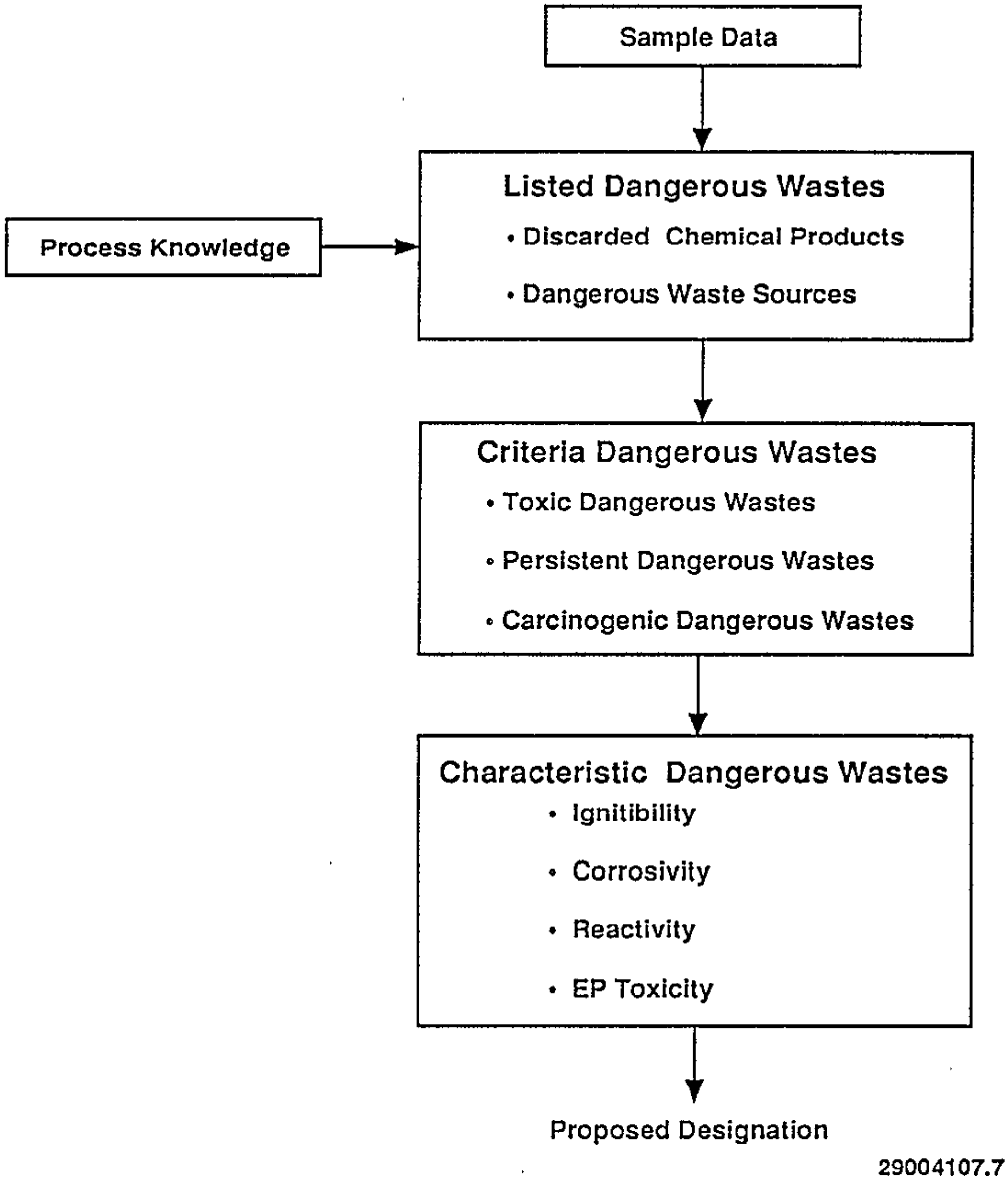
A waste is considered a listed dangerous waste if it either contains a discarded chemical product (WAC 173-303-081) or originates from a dangerous waste source (per WAC 173-303-082). The proposed designation was based on a combination of process knowledge and sample data.

5.1.1 Discarded Chemical Products

A wastestream constituent is a discarded chemical product (WAC 173-303-081) if it is listed in WAC 173-303-9903 and is characterized by one or more of the following descriptions.

- The constituent is the sole active ingredient in a commercial chemical product that has been discarded. Commercial chemical products that, as purchased, contained two or more active ingredients were not designated as discarded chemical products. Products that contained nonactive components such as water, however, were so designated if the sole active ingredient in the mixture was listed in WAC 173-303-9903.
- The constituent results from a spill of unused commercial chemical products. (A spill of a discarded chemical product would cause a wastestream to be designated during the time that the discharge is occurring. The approach taken is that the current wastestream

Figure 5-1. Designation Strategy.



would not be designated unless a review of past spill events indicates that the spills are predictable, systematic events that are ongoing and are reasonably anticipated to occur in the future. The evaluation of this criteria in this report is based on a review of spill data reported under the *Comprehensive Environmental Response, Compensation, and Liability Act* [CERCLA]).

- The constituent is discarded in the form of a residue resulting from cleanup of a spill of an unused commercial chemical product contained on the discarded chemical products list. (A chemical product that is used in a process and then released to the wastestream is not a discarded chemical product. Off-specification unused chemicals and chemicals that have exceeded a shelf-life but have not been used are considered discarded chemical products.)

5.1.2 Dangerous Waste Sources

A list of dangerous waste sources is contained in WAC 173-303-9904, pursuant to WAC 173-303-082. There are three major categories of sources in WAC 173-303-9904. The first is nonspecific sources from routine maintenance operations occurring at many industries. The second is specific sources (e.g., wastes from ink formulation). The third is a state source, which are limited to polychlorinated biphenyl-contaminated transformers and capacitors resulting from salvaging, rebuilding, or discarding activities.

5.2 LISTED WASTE DATA CONSIDERATIONS

The proposed designation of the wastestream contained in this report is based on an evaluation of process knowledge and on sample data. The following sections describe the types of information used in this designation.

5.2.1 Process Evaluation

The process evaluation began with a thorough review of the processes contributing to the wastestream. Processes were reviewed and compared with the dangerous waste source list (no chemicals are discarded into the stream). This process evaluation is necessary because the stream could be a listed waste if a listed waste was known to have been added at any upstream location, even if a listed constituent was not detected at the sample point. The process evaluation included a thorough review of process diagrams and operating procedures. It should be noted that no laboratory drains are connected to the SCD and the only physical accesses to the essentially closed SCD system are in remote radiation zones and/or are controlled administratively. The processes contributing to the PUREX Plant SCD is the flow of steam and cooling water through the heating and cooling coils of vessels listed in Table 2-1. Because there are no other normal or routine entry paths to this wastestream, this evaluation was quite straight forward.

Additionally, waste handling practices at the PUREX Plant were reviewed. The PUREX Plant has a very aggressive program of waste handling training, certification, oversight, and technical support that assures that hazardous wastes are disposed of properly. Administrative controls are discussed in Section 2.3.1.3.

If a potentially listed source was identified, the process was evaluated to determine if the process resulted in the generation of a listed waste.

5.2.2 Sampling Data

Sampling data were used as a screening tool to enhance and support the results of the previously discussed process evaluation. This screening compared the results of the sampling data with the WAC 173-303-9903 and -9904 lists. If a constituent was contained on one or both of these lists, an engineering evaluation was performed to determine if it had entered the wastestream as a discarded chemical product or came from a dangerous waste source.

Screening organic constituents is a relatively simple procedure because organic constituents are reported as substances and are easily compared to the WAC 173-303-9903 and -9904 lists. This screening is not easily performed on inorganic analytical data. This is because inorganic analytes are reported as ions or elements rather than substances. For example, an analysis may show a wastestream contains the cations sodium and calcium along with the anions chloride and nitrate. The possible combinations of neutral substances from this simple example include sodium chloride, sodium nitrate, calcium chloride, and calcium nitrate. In a real example, with many cation and anions, the list of possible combinations is extensive.

A procedure was developed by the Westinghouse Hanford for combining the inorganic constituents into substances. This screening procedure is described in the *Wastestream Designation of Liquid Effluent Data* (WHC 1990c) and is intended to be a tool in the evaluation of a wastestream. The listing of the inorganic substances developed by this screening procedure is not intended to be an indication that the substance was discharged to the wastestream, only that the necessary cations and anions are present and an investigation should be conducted to determine how they entered the wastestream.

Table 5-1 gives the result of the inorganic constituent combination procedure along with appropriate explanatory footnotes.

5.3 PROPOSED LISTED WASTE DESIGNATIONS

A process evaluation along with a review of sampling data indicates that the SCD did not contain a discharged chemical product or waste from a listed waste source. The following sections will present a discussion of the evaluation that was conducted to substantiate this conclusion.

Table 5-1. Inorganic Chemistry for PUREX Steam Condensate. (sheet 1 of 2)

Constituent	ppb	Ion	Eq/g	Normalized
Charge normalization:				
Barium	2.95E+01	Ba+2	4.30E-10	
Boron	2.37E+01	B407-2	1.09E-09	3.57E-09
Calcium	1.79E+04	Ca+2	8.95E-07	
Chloride	1.03E+03	Cl-1	2.91E-08	9.52E-08
Fluoride	1.23E+02	F-1	6.50E-09	2.12E-08
Iron	3.22E+01	Fe+3	1.73E-09	
Magnesium	4.25E+03	Mg+2	3.50E-07	
Nitrate	5.82E+02	NO3-1	9.39E-09	3.07E-08
Potassium	7.13E+02	K+1	1.82E-08	
Silicon	2.32E+03	SiO3-2	1.65E-07	5.39E-07
Sodium	2.05E+03	Na+1	8.93E-08	
Strontium	8.75E+01	Sr+2	2.00E-09	
Sulfate	9.79E+03	SO4-2	2.04E-07	6.66E-07
Uranium	5.68E-01	UO2+2	4.78E-12	
Zinc	5.64E+00	Zn+2	1.73E-10	
Hydrogen Ion (from pH 7.7)		H+	(1.94E-11)	
Hydroxide Ion (from pH)		OH-	(5.15E-10)	
Cation total			1.36E-06	
Anion total			4.16E-07	
Anion normalization factor:	3.266			

Substance formation: Substance	%	Cation out	Anion out
Uranyl nitrate	9.41E-08	0.00E+00	3.06E-08
Iron(III) fluoride	6.51E-06	0.00E+00	1.95E-08
Potassium fluoride	1.06E-04	0.00E+00	1.27E-09
Barium chloride	4.47E-06	0.00E+00	9.47E-08
Sodium fluoride	5.31E-06	8.81E-08	0.00E+00
Zinc nitrate	1.64E-06	0.00E+00	3.05E-08
Magnesium chloride	4.51E-04	2.55E-07	0.00E+00
Magnesium nitrate	2.40E-04	2.25E-07	0.00E+00
Calcium tetraborate	3.49E-05	8.92E-07	0.00E+00
Magnesium sulfate	1.35E-03	0.00E+00	4.41E-07
Sodium metasilicate	5.38E-04	0.00E+00	4.51E-07
Strontium sulfate	1.84E-05	0.00E+00	4.39E-07
Calcium sulfate	2.99E-03	4.53E-07	0.00E+00

NOTES: Statistics based on a single datum are noted by an asterisk (*). With the exception of hydrogen ion and hydroxide, others report the upper limit of the one-tailed 90% confidence interval. Hydrogen ion is based on the lower limit of the one-tailed 90% confidence interval for pH sets with mean values below 7.25 and on the upper limit of the one-tailed 90% confidence interval for pH data sets with mean values of 7.25 or higher. The hydroxide magnitude is equal to 1.00E-20 equivalents per gram (Eq/g)**2 divided by the hydrogen ion value (in Eq/g).

Table 5-1. Inorganic Chemistry for PUREX Steam Condensate. (sheet 2 of 2)

Ion concentrations in Eq/g are based on the statistic. Conversions include scale (ppb to g/g), molecular weight (constituent form to ionic form), and equivalents (charges per ion). The column headed "Normalized" shows normalized concentrations (also in Eq/g) calculated by increasing concentrations of cations, excluding Hydrogen ion, or anions, excluding hydroxide, by the normalization factor. The normalization factor is the larger of the cation total, including Hydrogen ion, or anion total, including hydroxide, divided by the smaller total.

Substance names may include MB (monobasic), DB (dibasic), TB (tribasic) to identify the equivalents of hydrogen ion that have been neutralized from polycrotic weak acids to form their conjugate bases.

Substances are formulated in the order listed. The column headed "%" is the percent of the substance in the waste (gms/100gms). Substances formulated with oxygen are based on the residual concentration of the counterion. Other substance concentrations are based on the limiting residual concentration of the cation or anion. The columns headed "Cation Out" and "Anion Out" indicate the residual concentrations (in Eq/g) of each ion after a substance concentration has been calculated.

5.3.1 Discarded Chemical Products

As discussed in Section 5.2, a process evaluation of the contributors to the SCD was conducted. The contributors were found to consist of cooling water pumped from the Columbia River and condensed steam. The steam is produced in the 200 East Area powerhouse, which adds Super Filmeen 14. The Super Filmeen 14 is used as a corrosion inhibitor.

Table 5-2 contains a listing of the three potential discarded chemical products identified from sampling data using the screening procedure described in Section 5.2. Of these three compounds, none are added to the SCD.

Based on the considerations and data presented in the following sections, it is concluded that the wastestream does not contain any discarded chemical products.

5.3.1.1 Suspect Substances. Table 5-2 lists three suspect substances under the heading "Discarded Chemical Products." These three substances (hydrogen fluoride, acetone, and 1-butanol) are discussed below. The discussion led to the conclusion that the SCD does not contain listed discarded chemical products.

A review of CERCLA spill records for the period beginning October 1989 and ending March 1990 shows a single spill which involved chemicals of interest. This case was a spill of mixed solvent, which contained methylene chloride, to grade level soil. The spill did not reach any effluent streams.

5.3.1.1.1 Hydrogen Fluoride. Hydrogen fluoride is used as a complexing reagent in spectrophotometric analyses in PUREX laboratory operations. Interviews with laboratory personnel provided no evidence that hydrogen fluoride has been disposed to the SCD stream. As previously noted, there are no laboratory drains connecting to the SCD stream.

The highest detected concentration of fluorides in the SCD was 136 ppb. The threshold value for hydrogen fluoride based on water supplied to the PUREX Plant is 143 ppb as presented in Section 5.2 of the "parent" document. As the concentration of hydrogen fluoride seen in this wastewater stream is less than the threshold value, these data will not be considered in the designation of the wastestream as it is likely that hydrogen fluoride is present in these wastestream samples due to the presence of fluorides in the facility water supply.

5.3.1.1.2 Acetone. Acetone has been used in PUREX laboratory operations. Interviews with laboratory personnel provided no evidence that acetone had been disposed to the SCD and the use of acetone has been discontinued. As previously noted, there are no laboratory drains connecting to the SCD.

Acetone appeared in one of the six samples taken of the wastewater stream. The concentration of acetone in this sample of the wastewater was 10 ppb. A second analysis of this sample yielded a nondetection. The

Table 5-2. Dangerous Waste Designation Report for PUREX Steam Condensate. (sheet 1 of 2)

Dangerous Waste Data Designation Report for PUREX Steam Condensate

Finding: Undesignated

Discarded Chemical Products - WAC 173-303-081

Substance	Review Number	Status	DW Number
Hydrogen fluoride	U134(DW)	Not Discarded	Undesignated
Acetone	U002(DW)	Not Discarded	Undesignated
*1-Butanol	U031(DW)	Not Discarded	Undesignated

Dangerous Waste Sources - WAC 173-303-082

Substance	Review Number	Status	DW Number
Acetone	F003	Unlisted Source	Undesignated
*1-Butanol	F003	Unlisted Source	Undesignated

Infectous Dangerous Waste - WAC 173-303-083

No regulatory guidance

Dangerous Waste Mixtures - WAC 173-303-084

Substance	Toxic EC%	Persistant HH%	Persistant PAH%	Carcinogenic Total%
Barium chloride	4.47E-09	0.00E+00	0.00E+00	0.00E+00
Calcium tetraborate	3.49E-09	0.00E+00	0.00E+00	0.00E+00
Iron(III) fluoride	6.51E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium chloride	4.51E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	2.40E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium sulfate	1.35E-07	0.00E+00	0.00E+00	0.00E+00
Potassium fluoride	1.06E-07	0.00E+00	0.00E+00	0.00E+00
Sodium fluoride	5.31E-09	0.00E+00	0.00E+00	0.00E+00
Sodium metasilicate	5.38E-08	0.00E+00	0.00E+00	0.00E+00
Uranyl nitrate	9.41E-10	0.00E+00	0.00E+00	0.00E+00
Zinc nitrate	1.64E-09	0.00E+00	0.00E+00	0.00E+00
Acetone	1.00E-10	0.00E+00	0.00E+00	0.00E+00
*1-Butanol	2.40E-10	0.00E+00	0.00E+00	0.00E+00
Tributylphosphate	1.20E-10	0.00E+00	0.00E+00	0.00E+00
Total	4.45E-07	0.00E+00	0.00E+00	0.00E+00
DW Number	Undesignated	Undesignated	Undesignated	Undesignated

Dangerous Waste Characteristics - WAC 173-303-090

Characteristic	Value	DW Number
Ignitability (Degrees F)	>208	Undesignated
Corrosivity-pH	7.71	Undesignated
Reactivity Cyanide (mg/kg)	<1.00E+02	Undesignated
Reactivity Sulfide (mg/kg)	<1.00E+02	Undesignated
EP Toxic Arsenic (mg/L)	<5.00E-01	Undesignated
EP Toxic Barium (mg/L)	<1.00E+00	Undesignated
EP Toxic Cadmium (mg/L)	<1.00E-01	Undesignated
EP Toxic Chromium (mg/L)	<5.00E-01	Undesignated
EP Toxic Lead (mg/L)	<5.00E-01	Undesignated
EP Toxic Mercury (mg/L)	<2.00E-02	Undesignated
EP Toxic Selenium (mg/L)	<5.00E-01	Undesignated
EP Toxic Silver (mg/L)	<5.00E-01	Undesignated

9 1 1 1 3 7 5 0 1 7 1

Table 5-2. Dangerous Waste Designation Report for PUREX Steam Condensate. (sheet 2 of 2)

Dangerous Waste Data Designation Report for PUREX Steam Condensate

Dangerous Waste Criteria - WAC 173-303-100

Substance	Toxic EC%	Persistant HH%	Persistant PAH%	Carcinogenic Total%	DW Number-Positive
Barium chloride	4.47E-09	0.00E+00	0.00E+00	0.00E+00	
Calcium tetraborate	3.49E-09	0.00E+00	0.00E+00	0.00E+00	
Iron(III) fluoride	6.51E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium chloride	4.51E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium nitrate	2.40E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium sulfate	1.35E-07	0.00E+00	0.00E+00	0.00E+00	
Potassium fluoride	1.06E-07	0.00E+00	0.00E+00	0.00E+00	
Sodium fluoride	5.31E-09	0.00E+00	0.00E+00	0.00E+00	
Sodium metasilicate	5.38E-08	0.00E+00	0.00E+00	0.00E+00	
Uranyl nitrate	9.41E-10	0.00E+00	0.00E+00	0.00E+00	
Zinc nitrate	1.64E-09	0.00E+00	0.00E+00	0.00E+00	
Acetone	1.00E-10	0.00E+00	0.00E+00	0.00E+00	
*1-Butanol	2.40E-10	0.00E+00	0.00E+00	0.00E+00	
Tributylphosphate	1.20E-10	0.00E+00	0.00E+00	0.00E+00	
Total	4.45E-07	0.00E+00	0.00E+00	0.00E+00	
DW Number	Undesignated	Undesignated	Undesignated	Undesignated	

Dangerous Waste Constituents - WAC 173-303-9905

Substance
Hydrogen fluoride
Acetone
Barium and compounds,NOS

Substance names may include MB (monobasic), DB (dibasic), or TB (tribasic) to identify the equivalence of hydrogen ion that have been nutralized from polyprotic weak acids to form their conjugate bases.

Results based on a single datum are noted by an asterisk (*). Others are based on the lower limit of the one-tailed 90% confidence interval for pH data sets with mean values below 7.25 or by the upper limit of the one-tailed 90% confidence interval for all other data sets.

EP Toxic contaminants, ignitability, and reactivity are reported by standard methods when available. In the absence of EP Toxicity data, total contaminant concentrations are evaluated. In lieu of closed cup ignition results, ignitability is estimated from the sum of the contributions of all substances that are ignitable when pure. A waste is flagged as dangerous if sum of the ignitable substances exceeds one percent. Reactivity is by SW-846: 250 mg of cyanide as hydrogen cyanide per kg of waste or 500 mg of sulfide as hydrogen sulfide per kg of waste. Total cyanide and total sulfide are used in lieu of amenable cyanide and amenable sulfide.

Inorganic substances are fomulated and their possible concentrations calculated for designation purposes only. The actual existance in the waste of these substances is not implied and should not be infered.

threshold value for acetone based on analyses of current data blanks taken site wide is 37 ppb as presented in Section 5.2 of the "parent" document. As the concentration of acetone seen in this single sample of the wastewater stream is less than the threshold value, this data will not be considered in the designation of the wastestream as it is likely that acetone is present in these wastestream samples due to sample contamination.

5.3.1.1.3 1-Butanol. Butanol has been used in PUREX laboratory operations as a chemical product. Interviews with laboratory personnel provided no evidence that butanol had been disposed of into the SCD. As previously noted, there are no laboratory drains connecting to the SCD.

Butanol appeared in one of the six samples taken of the wastewater stream. The concentration of butanol in this sample was 24 ppb. The threshold value for butanol based on analyses of current data blanks taken site wide is 33 ppb, as presented in Section 5.2 of the "parent" document. As the concentration of butanol seen in this single sample of the wastewater stream is less than the threshold value, this data will not be considered in the designation of the wastestream as it is likely that butanol is present in these wastestream samples due to sample contamination. It is further noted that the two blank analyses associated with this particular sample of the SCD were found to contain butanol at a concentration of 23 ppb; this provides further evidence of the potential for sample contamination.

5.3.1.2 Leaks. As discussed in Section 5.2, a process evaluation of the contributors to the PUREX Plant SCD was conducted. The processes contributing to the SCD are the flow of steam and water through heating and cooling coils. Process solutions are physically isolated from the stream, except in the event of coil failures. Should a coil failure occur, the presence of radioactive process solutions in the effluent stream is identified by sensitive radiation monitoring instrumentation and the stream is diverted to a retention basin; it is not released into the environment unless confirmatory sample results provide evidence that the solution meets DOE guidelines for release to the soil column. There are no known leaks of process solutions to the SCD at this time; the small quantities of radioactive materials currently seen in the SCD are the result of residual contamination from past process leaks.

5.3.2 Dangerous Waste Sources

The process evaluation contained in Section 2.0 was also used to determine if the wastestream included any specific waste sources (K and W coded wastes) or any nonspecific wastes sources (F coded wastes). The process evaluation did not identify any sources of dangerous waste which discharge to the SCD.

As discussed previously, the sampling data were used to enhance the process evaluation. Table 5-2 lists the two potential spent solvents that were identified by sampling data: acetone and 1-butanol. As previously discussed in Section 5.3.1, no evidence was found that these chemicals were present in the SCD as the result of the disposal of waste chemicals from the

PUREX facility. It is also noted that the levels of acetone and 1-butanol seen in the samples are consistent with possible sample contamination based upon the results of blank analyses. Therefore, it is concluded that the SCD does not contain these chemicals as the result of the discard of a spent solvent.

5.4 DANGEROUS WASTE CRITERIA

A waste is considered a dangerous waste if it meets any of the following criteria categories (WAC 173-303-100): toxic dangerous waste, persistent dangerous waste, and carcinogenic dangerous waste. Dangerous waste mixtures are included in this discussion because this list of analytes is identical to the "criteria" list. A description of the methods used to test the sampling data against the criteria is contained in the *Wastestream Designations of Liquid Effluent Data* (WHC 1990c). Summaries and results of the methods are contained in the following sections.

5.4.1 Toxic Dangerous Waste

The procedure for determining if a wastestream is a toxic dangerous waste is as follows (WAC 173-303-101) (Ecology 1989).

- Collect and analyze multiple samples from the wastestream.
- Calculate the upper limit of the one-sided 90% confidence interval (CI) for each analyte in the wastestream (WHC 1990c).
- Formulate neutral substances from the analytical data. NOTE: This step is only required for inorganic analytes because it is not possible to complete the evaluation based on the concentration of cations and anions. This methodology is described in the *Wastestream Designations of Liquid Effluent Data* (WHC 1990c) and is based on an evaluation of the most toxic substances that can exist in an aqueous environment under normal temperatures and pressures.
- Assign toxic categories to the substances formulated for the wastestream.
- Calculate the contribution of each substance to the percent equivalent concentration (EC%).
- Calculate the EC% by summarizing the contributions of each substance.
- Designate the wastestream as a toxic dangerous waste if the EC% is greater than 0.001%, per WAC 173-303-9906.

Fourteen substances potentially present in the SCD were determined to have toxic categories associated with them. Table 5-2 lists these substances. The individual and sum equivalent concentration values for these substances are listed in Table 5-2. Because the equivalent concentration sum is 0.000000445%, which is less than the limit of 0.001%, the wastestream is not a toxic dangerous waste.

The three highest contributors to the equivalent concentration sum are magnesium sulfate, potassium fluoride, and iron (III) fluoride.

5.4.2 Persistent Dangerous Waste

The procedure for determining if a wastestream is a persistent dangerous waste is as follows (WAC 173-303-102).

- Collect multiple grab samples of the wastestream.
- Determine which substances in the wastestream are halogenated hydrocarbons (HH) and polycyclic aromatic hydrocarbons (PAH).
- Determine the upper limit of the one-sided 90%CI for the substances of interest (WHC 1990c).
- Calculate the weight contribution of each HH (HH%) and PAH%, separately.
- Sum the resulting HH% and PAH%, separately.
- Designate the wastestream as persistent if the HH% concentration is greater than 0.01% or if the PAH% concentration is greater than 1.0%, in accordance with WAC 173-303-9907 (Ecology 1989).

No chemical compounds potentially present in the SCD were determined to be HH, and no chemical compounds were determined to be PAH. The SCD is not a persistent dangerous waste.

5.4.3 Carcinogenic Dangerous Waste

The procedure for determining if a wastestream is a carcinogenic dangerous waste is as follows (WAC 173-303-103).

- Collect multiple grab samples of the wastestream.
- Determine the upper limit of the one-sided 90%CI for the substances of interest (WHC 1990c).
- Formulate neutral substances from the analytical data. NOTE: This step is only required for inorganic analytes because it is not possible to complete the evaluation based on the concentration of cations and anions. This methodology is described in the *Wastestream Designations of Liquid Effluent Data* (WHC 1990c) and is based on an evaluation of the carcinogenic substances that exist in an aqueous environment under normal temperatures and pressures.

- Determine which substances in the wastestream are human or animal carcinogens according to the International Agency for Research on Cancer.
- Calculate the weight percent concentration for each carcinogen.
- Sum the resulting weight percent.
- Designate the wastestream as carcinogenic if any of the positive carcinogens are above 0.01%, or if the total concentration for positive or suspected carcinogens is above 1.0%.

No substances potentially present in the SCD were determined to be carcinogenic substances. Therefore, the wastestream is not a carcinogenic dangerous waste.

5.5 DANGEROUS WASTE CHARACTERISTICS

A waste is considered a dangerous waste if it is ignitable, corrosive, reactive, and/or extraction procedure (EP) toxic (WAC 173-303-090) (Ecology 1989). A description of the methods used to evaluate the data in terms of these characteristics is contained in *Wastestream Designations of Liquid Effluent Data* (WHC 1990c). Summaries of the methods, along with the results, are contained in the following sections.

5.5.1 Ignitability

Flashpoint testing was performed on the SCD. The tests determined that the SCD did not have a flashpoint less than 208 °F. Therefore, the SCD is not ignitable.

5.5.2 Corrosivity

A waste is a corrosive dangerous waste if it has a pH of ≤2.0 or ≥12.5. The comparison to the characteristic was based on the comparison to the one-sided 90%CI for a stream with a mean value of pH below 7.25 and the upper limit of the 90%CI if the mean value of one-sided pH ≥7.25.

Because the mean value of the pH measurements for the PUREX SCD is above 7.25, the upper CI limit, 7.71, is used. The wastestream is not a corrosive dangerous waste (WAC 173-303-090[6]).

Currently there are no corrosion test data available for the SCD stream. Experience would indicate that since a filming amine is present in the steam and since the anion concentrations of chloride, sulfate, and sulfide are low, it would be expected that corrosion rates would be low.

5.5.3 Reactivity

An aqueous waste is reactive if the waste contains an amount of cyanide or sulfide that could threaten human health or the environment at a pH of 2 to 12.5 (WAC 173-303-090[7]). A recent revision to *Test Methods for Evaluation, Solid Waste* (SW-846) (EPA 1986) provides more quantitative indicator levels for cyanide and sulfide. It states that levels of cyanide as (equivalent) hydrogen cyanide below 250 mg/kg or of (equivalent) sulfide as hydrogen sulfide below 500 mg/kg would not be considered reactive.

The revised SW-846 procedure was used to evaluate reactivity for the SCD samples.

A total of <100 mg/kg total sulfide and a maximum of <100 mg/kg total cyanide were reported in Table 5-2. Therefore, this wastestream is not a reactive dangerous waste.

5.5.4 Extraction Procedure Toxicity

A waste is an EP toxic dangerous waste if containment results from EP toxicity testing exceed limits of WAC 173-303-090(8)(c). The EP toxicity testing did not disclose any contaminants exceeding the limits of WAC 173-303-090(8)(c). Therefore, the SCD is not an EP toxic dangerous waste.

5.6 PROPOSED DESIGNATIONS

The SCD stream has been evaluated in accordance with the procedure defined in WAC 173-303-070 to determine if it should be designated as a dangerous waste. It has been demonstrated that this stream is not a dangerous waste, based on the following criteria:

- Dangerous Waste Lists (WAC 173-303-080)
- Dangerous Waste Criteria (WAC 173-303-100)
- Dangerous Waste Characteristics (WAC 173-303-090).

Therefore, it is proposed that the SCD stream not be designated a dangerous waste.

6.0 ACTION PLAN

This chapter addresses recommendations for future waste characterization tasks for the SCD that are within the scope of the Liquid Effluent Study. The final extent of and schedule for any recommended tasks are subject to negotiation between Ecology, the EPA, and DOE. An implementation schedule for the completion of these tasks will give consideration to other compliance actions already under way as part of the Tri-Party Agreement (Ecology et al. 1989), and on the availability of funding. All effluent monitoring and sampling will be conducted according to DOE Order 5400.1 ("General Environmental Protection Program", issued November 9, 1988).

6.1 FUTURE SAMPLING

The random sampling conducted during the October 1989 to March 1990 period covered the only process configuration. All of the equipment which normally contributes to the SCD operated during this period.

There are no significant changes expected in the SCD. Therefore, there is currently no foreseen need to further sample the SCD.

During several discussions regarding the background level of analytes in the raw water and steam, it became apparent that the existing data could be improved. Additional site wide background sampling and analysis is recommended if resources are available.

6.2 TECHNICAL ISSUES

As described in Section 2.0, the SCD was sampled at the 295-AA. This sample point was chosen because it is a common, accessible location downstream of nearly all contributors to the SCD (see Section 6.3). The samples collected at this point show that the SCD has the composition expected for a pass-through stream composed of cooling water and steam condensate. As a result, the characterization data presented in this report are considered to be representative of the SCD. Furthermore, the configuration sampled is the only configuration for this stream. Therefore, additional sampling of the SCD is not recommended.

The primary technical issue which can be raised relative to the sampling is that the individual contributors were not sampled before they entered the SCD. The combination of process knowledge and sample results shows, however, that there is no reason to suspect that any of the contributors contain dangerous waste. Furthermore, the sampling of the individual contributors is not practical: the contributors arise in a remote area exposed to high radiation fields and exit the building below grade. Several contributors exhibit two-phase flow. Extensive resources would be needed to design and install additional, new sampling points.

6.3 PIPING CONFIGURATION CHECK

The railroad tunnel is primarily expected to contribute condensate but can also contribute raw water (used for cleaning) and rainwater contaminated with radionuclides. This drainage may enter the header downstream of the sampling point. An investigation, including the examination of old facility modification records, will continue until this issue is resolved. Any lines not routed upstream of the sample point will be rerouted or blanked. Resampling is not recommended at this time because this potentially unsampled contributor is volumetrically insignificant and, based on process knowledge, did not contain dangerous waste during the current period.

7.0 REFERENCES

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APPENDIX A

SUPER FILMEEN 14 MATERIAL SAFETY DATA SHEET

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Figure A-1. Super Filmeen 14 Material Safety Data Sheet.
(sheet 1 of 2)

Material Safety Data Sheet MSDS #12387

Emergency Phone 312-438-8241

Section 1 Product Identification

TRADE NAME	PRODUCT TYPE	CODE IDENT
SUPER FILMEEN 14	Return line treatment	12-174

DOT SHIPPING NAME
Compound Boiler Cleansing, Preserving, Scale Removing Liquid

Section 2 Hazardous Ingredients

CAS NUMBER | % | EXPOSURE CRITERIA

Does not contain hazardous constituents under 29 CFR 1910.1200, d(3) & (4).

HIMS 2-0-0

Section 3 Physical Data

BOILING POINT, 760 mm Hg	ND	MELTING POINT	NA
FREEZING POINT	32 F	VAPOR PRESSURE	ND
SPECIFIC GRAVITY (H_2O = 1)	0.98	SOLUBILITY IN H_2O	Emulsion
VAPOR DENSITY (AIR = 1)	ND	EVAPORATION RATE (By Ac = 1)	< 1
% VOLATILES BY VOLUME	ND	pH	8-9

APPEARANCE & ODOR

White emulsion/characteristic odor

Section 4 Fire & Explosion Hazard Data

FLASH POINT (& METHOD USED)	FLAMMABLE LIMITS IN AIR % BY VOLUME LOWER	UPPER	AUTO IGNITION TEMPERATURE
NA, water-based product	NA	NA	NA

EXTINGUISHING MEDIA: FOAM CO2 DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES:

Firefighters should wear full protective gear.

UNUSUAL FIRE AND EXPLOSION HAZARD:

None known

Section 5 Reactivity Data

STABILITY (NORMAL CONDITIONS): Stable
CONDITIONS TO AVOID: Extreme heat

INCOMPATABILITY (MATERIALS TO AVOID)

Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO2, nitrogen oxides

HAZARDOUS POLYMERIZATION: Will not occur
CONDITIONS TO AVOID: NA

GRACE Dearborn

Dearborn Division W. R. Grace & Co., 300 Genesee Street, Lake Zurich, IL 60047

Figure A-1. Super Filmeen 14 Material Safety Data Sheet.
(sheet 2 of 2)

Material Safety Data Sheet (continued) SUPER FILMEEN 14 CONTINUED

Section 6 Health Hazard Information

TOXICITY INFORMATION:

No TLV established for product.

MSDS #12387

EFFECTS OF OVEREXPOSURE:

INHALATION: Inhalation of vapors or mist may irritate nasal passages.

INGESTION: Harmful if swallowed.

SKIN OR EYE CONTACT: Prolonged or frequent skin contact may cause irritation.

EMERGENCY AND FIRST AID PROCEDURES

INHALATION: Remove affected persons to fresh air and treat symptoms.

INGESTION: If conscious, induce vomiting and feed citrus juice. Contact physician.

SKIN CONTACT: Wash with soap and water. Remove and wash contaminated clothing.

EYE CONTACT: Flush eyes with water and seek medical attention.

Section 7 Special Protection Information

VENTILATION REQUIREMENTS
Use adequate mechanical ventilation.

RESPIRATORY PROTECTION (SPECIFY TYPE)
None special

EYE PROTECTION
Safety glasses or goggles

GLOVES
Recommended

OTHER PROTECTIVE CLOTHING AND EQUIPMENT
Long sleeve work shirt and pants.

Section 8 Spill or Leak Procedures

STEPS TO TAKE IF MATERIAL IS RELEASED OR SPILLED

Collect using absorbent, place in container for proper disposal. Flush area of spill with water.

WASTE DISPOSAL METHOD

Dispose using authorized scavenger service in authorized landfill. For additional disposal instruction, contact your state water pollution control agency. This product is NOT an EPA Hazardous Waste.

Section 9 Special Precautions

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Keep container closed to prevent contamination or loss of water from emulsion by evaporation. Keep from freezing.

OTHER PRECAUTIONS

For industrial use only. Keep out of reach of children.

PREPARED BY: S. Morss DATE: 6/20/88

GRACE Dearborn

Dearborn Division W. R. Grace & Co., 300 Genesee Street, Lake Zurich [illegible]

APPENDIX B

CHEMICAL/RADIOLOGICAL PRESENT SAMPLE DATA

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Table B-1. Present Steam Condensate Sample Results. (sheet 1 of 10)

Constituent	Sample #	Date	Method	Result
Arsenic (EP Toxic)	50792E	11/27/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50883E	1/16/90	ICP	<5.00E+02
Arsenic (EP Toxic)	50887E	1/17/90	ICP	<5.00E+02
Arsenic (EP Toxic)	50899E	1/24/90	ICP	<5.00E+02
Arsenic (EP Toxic)	51016E	3/06/90	ICP	<5.00E+02
Arsenic (EP Toxic)	51075E	3/20/90	ICP	<5.00E+02
Barium	50792	11/27/89	ICP	3.00E+01
Barium	50883	1/16/90	ICP	2.80E+01
Barium	50887	1/17/90	ICP	3.00E+01
Barium	50899	1/24/90	ICP	2.80E+01
Barium	51016	3/06/90	ICP	2.40E+01
Barium	51075	3/20/90	ICP	2.90E+01
Barium (EP Toxic)	50792E	11/27/89	ICP	<1.00E+03
Barium (EP Toxic)	50883E	1/16/90	ICP	<1.00E+03
Barium (EP Toxic)	50887E	1/17/90	ICP	<1.00E+03
Barium (EP Toxic)	50899E	1/24/90	ICP	<1.00E+03
Barium (EP Toxic)	51016E	3/06/90	ICP	<1.00E+03
Barium (EP Toxic)	51075E	3/20/90	ICP	<1.00E+03
Boron	50792	11/27/89	ICP	<1.00E+01
Boron	50883	1/16/90	ICP	<1.00E+01
Boron	50887	1/17/90	ICP	1.40E+01
Boron	50899	1/24/90	ICP	<1.00E+01
Boron	51016	3/06/90	ICP	3.20E+01
Boron	51075	3/20/90	ICP	2.90E+01
Cadmium (EP Toxic)	50792E	11/27/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50883E	1/16/90	ICP	<1.00E+02
Cadmium (EP Toxic)	50887E	1/17/90	ICP	<1.00E+02
Cadmium (EP Toxic)	50899E	1/24/90	ICP	<1.00E+02
Cadmium (EP Toxic)	51016E	3/06/90	ICP	<1.00E+02
Cadmium (EP Toxic)	51075E	3/20/90	ICP	<1.00E+02
Calcium	50792	11/27/89	ICP	1.71E+04
Calcium	50883	1/16/90	ICP	1.73E+04
Calcium	50887	1/17/90	ICP	1.81E+04
Calcium	50899	1/24/90	ICP	1.79E+04
Calcium	51016	3/06/90	ICP	1.49E+04
Calcium	51075	3/20/90	ICP	1.80E+04
Chloride	50792	11/27/89	IC	9.00E+02
Chloride	50883	1/16/90	IC	1.10E+03
Chloride	50887	1/17/90	IC	1.10E+03
Chloride	50899	1/24/90	IC	1.00E+03
Chloride	51016	3/06/90	IC	8.00E+02
Chloride	51075	3/20/90	IC	8.00E+02
Chromium (EP Toxic)	50792E	11/27/89	ICP	<5.00E+02
Chromium (EP Toxic)	50883E	1/16/90	ICP	<5.00E+02
Chromium (EP Toxic)	50887E	1/17/90	ICP	<5.00E+02
Chromium (EP Toxic)	50899E	1/24/90	ICP	<5.00E+02

Table B-1. Present Steam Condensate Sample Results. (sheet 2 of 10)

Constituent	Sample #	Date	Method	Result
Chromium (EP Toxic)	51016E	3/06/90	ICP	<5.00E+02
Chromium (EP Toxic)	51075E	3/20/90	ICP	<5.00E+02
Fluoride	50792	11/27/89	IC	<5.00E+02
Fluoride	50792	11/27/89	ISE	1.36E+02
Fluoride	50883	1/16/90	IC	<5.00E+02
Fluoride	50883	1/16/90	ISE	1.17E+02
Fluoride	50887	1/17/90	IC	<5.00E+02
Fluoride	50887	1/17/90	ISE	1.13E+02
Fluoride	50899	1/24/90	IC	<5.00E+02
Fluoride	50899	1/24/90	ISE	1.14E+02
Fluoride	51016	3/06/90	IC	<5.00E+02
Fluoride	51016	3/06/90	ISE	1.15E+02
Fluoride	51075	3/20/90	IC	<5.00E+02
Fluoride	51075	3/20/90	ISE	1.14E+02
Iron	50792	11/27/89	ICP	3.30E+01
Iron	50883	1/16/90	ICP	<3.00E+01
Iron	50887	1/17/90	ICP	<3.00E+01
Iron	50899	1/24/90	ICP	3.20E+01
Iron	51016	3/06/90	ICP	3.30E+01
Iron	51075	3/20/90	ICP	<3.00E+01
Lead (EP Toxic)	50792E	11/27/89	ICP	<5.00E+02
Lead (EP Toxic)	50883E	1/16/90	ICP	<5.00E+02
Lead (EP Toxic)	50887E	1/17/90	ICP	<5.00E+02
Lead (EP Toxic)	50899E	1/24/90	ICP	<5.00E+02
Lead (EP Toxic)	51016E	3/06/90	ICP	<5.00E+02
Lead (EP Toxic)	51075E	3/20/90	ICP	<5.00E+02
Magnesium	50792	11/27/89	ICP	3.94E+03
Magnesium	50883	1/16/90	ICP	4.06E+03
Magnesium	50887	1/17/90	ICP	4.25E+03
Magnesium	50899	1/24/90	ICP	4.08E+03
Magnesium	51016	3/06/90	ICP	3.59E+03
Magnesium	51075	3/20/90	ICP	4.49E+03
Mercury (EP Toxic)	50792E	11/27/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50883E	1/16/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50887E	1/17/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50899E	1/24/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	51016E	3/06/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	51075E	3/20/90	CVAA/M	<2.00E+01
Nitrate	50792	11/27/89	IC	6.00E+02
Nitrate	50883	1/16/90	IC	6.00E+02
Nitrate	50887	1/17/90	IC	6.00E+02
Nitrate	50899	1/24/90	IC	5.00E+02
Nitrate	51016	3/06/90	IC	<5.00E+02
Nitrate	51075	3/20/90	IC	<5.00E+02
Potassium	50792	11/27/89	ICP	7.24E+02
Potassium	50883	1/16/90	ICP	6.67E+02

Table B-1. Present Steam Condensate Sample Results. (sheet 3 of 10)

Constituent	Sample #	Date	Method	Result
Potassium	50887	1/17/90	ICP	6.94E+02
Potassium	50899	1/24/90	ICP	6.60E+02
Potassium	51016	3/06/90	ICP	6.02E+02
Potassium	51075	3/20/90	ICP	7.45E+02
Selenium (EP Toxic)	50792E	11/27/89	ICP	<5.00E+02
Selenium (EP Toxic)	50883E	1/16/90	ICP	<5.00E+02
Selenium (EP Toxic)	50887E	1/17/90	ICP	<5.00E+02
Selenium (EP Toxic)	50899E	1/24/90	ICP	<5.00E+02
Selenium (EP Toxic)	51016E	3/06/90	ICP	<5.00E+02
Selenium (EP Toxic)	51075E	3/20/90	ICP	<5.00E+02
Silicon	50792	11/27/89	ICP	2.26E+03
Silicon	50883	1/16/90	ICP	2.27E+03
Silicon	50887	1/17/90	ICP	2.35E+03
Silicon	50899	1/24/90	ICP	2.30E+03
Silicon	51016	3/06/90	ICP	1.87E+03
Silicon	51075	3/20/90	ICP	2.23E+03
Silver (EP Toxic)	50792E	11/27/89	ICP	<5.00E+02
Silver (EP Toxic)	50883E	1/16/90	ICP	<5.00E+02
Silver (EP Toxic)	50887E	1/17/90	ICP	<5.00E+02
Silver (EP Toxic)	50899E	1/24/90	ICP	<5.00E+02
Silver (EP Toxic)	51016E	3/06/90	ICP	<5.00E+02
Silver (EP Toxic)	51075E	3/20/90	ICP	<5.00E+02
Sodium	50792	11/27/89	ICP	2.01E+03
Sodium	50883	1/16/90	ICP	2.05E+03
Sodium	50887	1/17/90	ICP	2.07E+03
Sodium	50899	1/24/90	ICP	1.99E+03
Sodium	51016	3/06/90	ICP	1.76E+03
Sodium	51075	3/20/90	ICP	2.03E+03
Strontium	50792	11/27/89	ICP	8.60E+01
Strontium	50883	1/16/90	ICP	7.80E+01
Strontium	50887	1/17/90	ICP	8.10E+01
Strontium	50899	1/24/90	ICP	8.20E+01
Strontium	51016	3/06/90	ICP	7.70E+01
Strontium	51075	3/20/90	ICP	9.60E+01
Sulfate	50792	11/27/89	IC	9.00E+03
Sulfate	50883	1/16/90	IC	9.70E+03
Sulfate	50887	1/17/90	IC	9.70E+03
Sulfate	50899	1/24/90	IC	9.50E+03
Sulfate	51016	3/06/90	IC	8.70E+03
Sulfate	51075	3/20/90	IC	1.02E+04
Uranium	50792	11/27/89	FLUOR	5.17E-01
Uranium	50883	1/16/90	FLUOR	6.07E-01
Uranium	50887	1/17/90	FLUOR	6.11E-01
Uranium	50899	1/24/90	FLUOR	5.16E-01
Uranium	51016	3/06/90	FLUOR	4.61E-01
Uranium	51075	3/20/90	FLUOR	4.40E-01

Table B-1. Present Steam Condensate Sample Results. (sheet 4 of 10)

Constituent	Sample #	Date	Method	Result
Zinc	50792	11/27/89	ICP	<5.00E+00
Zinc	50883	1/16/90	ICP	<5.00E+00
Zinc	50887	1/17/90	ICP	<5.00E+00
Zinc	50899	1/24/90	ICP	6.00E+00
Zinc	51016	3/06/90	ICP	<5.00E+00
Zinc	51075	3/20/90	ICP	6.00E+00
Acetone	50792	11/27/89	VOA	<1.00E+01
Acetone	50792	11/27/89	ABN	<1.00E+01
Acetone	50792B	11/27/89	VOA	<1.00E+01
Acetone	50883	1/16/90	VOA	<1.00E+01
Acetone	50883	1/16/90	ABN	<1.00E+01
Acetone	50883B	1/16/90	VOA	<6.00E+00
Acetone	50883T	1/16/90	VOA	<7.00E+00
Acetone	50887	1/17/90	VOA	<1.00E+01
Acetone	50887	1/17/90	ABN	<1.00E+01
Acetone	50887B	1/17/90	VOA	<1.00E+01
Acetone	50887T	1/17/90	VOA	<1.00E+01
Acetone	50899	1/24/90	VOA	<1.00E+01
Acetone	50899	1/24/90	ABN	<1.00E+01
Acetone	50899B	1/24/90	VOA	<6.00E+00
Acetone	50899T	1/24/90	VOA	<6.00E+00
Acetone	51016	3/06/90	VOA	1.00E+01
Acetone	51016	3/06/90	ABN	<1.00E+01
Acetone	51016B	3/06/90	VOA	<5.00E+00
Acetone	51016T	3/06/90	VOA	<1.00E+01
Acetone	51075	3/20/90	VOA	<1.00E+01
Acetone	51075B	3/20/90	VOA	<1.00E+01
Acetone	51075T	3/20/90	VOA	<1.00E+01
1-Butanol	50792	11/27/89	DIGC	<1.00E+04
1-Butanol	50883	1/16/90	DIGC	<1.00E+04
1-Butanol	50887	1/17/90	DIGC	<1.00E+04
1-Butanol	50899	1/24/90	DIGC	<1.00E+04
1-Butanol	51016	3/06/90	VOA	2.40E+01
1-Butanol	51016	3/06/90	DIGC	<1.00E+04
1-Butanol	51016B	3/06/90	VOA	2.30E+01
1-Butanol	51016T	3/06/90	VOA	2.30E+01
1-Butanol	51075	3/20/90	DIGC	<1.00E+04
2-Butanone	50792	11/27/89	VOA	<1.00E+01
2-Butanone	50792B	11/27/89	VOA	<1.00E+01
2-Butanone	50883	1/16/90	VOA	<1.00E+01
2-Butanone	50883B	1/16/90	VOA	<1.00E+01
2-Butanone	50883T	1/16/90	VOA	<1.00E+01
2-Butanone	50887	1/17/90	VOA	<1.00E+01
2-Butanone	50887B	1/17/90	VOA	<6.00E+00
2-Butanone	50887T	1/17/90	VOA	<1.00E+01
2-Butanone	50899	1/24/90	VOA	<1.00E+01

Table B-1. Present Steam Condensate Sample Results. (sheet 5 of 10)

Constituent	Sample #	Date	Method	Result
2-Butanone	50899B	1/24/90	VOA	1.50E+01
2-Butanone	50899T	1/24/90	VOA	1.60E+01
2-Butanone	51016	3/06/90	VOA	<1.00E+01
2-Butanone	51016B	3/06/90	VOA	<1.00E+01
2-Butanone	51016T	3/06/90	VOA	<1.00E+01
2-Butanone	51075	3/20/90	VOA	<1.00E+01
2-Butanone	51075B	3/20/90	VOA	<1.00E+01
2-Butanone	51075T	3/20/90	VOA	<1.00E+01
Dichloromethane	50792	11/27/89	VOA	<5.00E+00
Dichloromethane	50792B	11/27/89	VOA	<5.00E+00
Dichloromethane	50883	1/16/90	VOA	<5.00E+00
Dichloromethane	50883B	1/16/90	VOA	<5.00E+00
Dichloromethane	50883T	1/16/90	VOA	<5.00E+00
Dichloromethane	50887	1/17/90	VOA	<5.00E+00
Dichloromethane	50887B	1/17/90	VOA	<3.00E+00
Dichloromethane	50887T	1/17/90	VOA	1.50E+01
Dichloromethane	50899	1/24/90	VOA	<5.00E+00
Dichloromethane	50899B	1/24/90	VOA	<4.00E+00
Dichloromethane	50899T	1/24/90	VOA	<3.00E+00
Dichloromethane	51016	3/06/90	VOA	<5.00E+00
Dichloromethane	51016B	3/06/90	VOA	5.00E+00
Dichloromethane	51016T	3/06/90	VOA	<5.00E+00
Dichloromethane	51075	3/20/90	VOA	<5.00E+00
Dichloromethane	51075B	3/20/90	VOA	<5.00E+00
Dichloromethane	51075T	3/20/90	VOA	<5.00E+00
Tetrahydrofuran	50792	11/27/89	VOA	<1.00E+01
Tetrahydrofuran	50792B	11/27/89	VOA	<1.00E+01
Tetrahydrofuran	50883	1/16/90	VOA	<1.00E+01
Tetrahydrofuran	50883B	1/16/90	VOA	<7.00E+00
Tetrahydrofuran	50883T	1/16/90	VOA	<9.00E+00
Tetrahydrofuran	50887	1/17/90	VOA	<1.00E+01
Tetrahydrofuran	50887B	1/17/90	VOA	<1.00E+01
Tetrahydrofuran	50887T	1/17/90	VOA	<1.00E+01
Tetrahydrofuran	50899	1/24/90	VOA	<1.00E+01
Tetrahydrofuran	50899B	1/24/90	VOA	<5.00E+00
Tetrahydrofuran	50899T	1/24/90	VOA	<6.00E+00
Tetrahydrofuran	51016	3/06/90	VOA	<1.00E+01
Tetrahydrofuran	51016B	3/06/90	VOA	1.00E+01
Tetrahydrofuran	51016T	3/06/90	VOA	<1.00E+01
Tetrahydrofuran	51075	3/20/90	VOA	<1.00E+01
Tetrahydrofuran	51075B	3/20/90	VOA	<1.00E+01
Tetrahydrofuran	51075T	3/20/90	VOA	<1.00E+01
Tributylphosphate	50792	11/27/89	ABN	<1.00E+01
Tributylphosphate	50883	1/16/90	ABN	<1.00E+01
Tributylphosphate	50887	1/17/90	ABN	<1.00E+01
Tributylphosphate	50899	1/24/90	ABN	1.40E+01

Table B-1. Present Steam Condensate Sample Results. (sheet 6 of 10)

Constituent	Sample #	Date	Method	Result
Tributylphosphate	51016	3/06/90	ABN	<1.00E+01
Trichloromethane	50792	11/27/89	VOA	<5.00E+00
Trichloromethane	50792B	11/27/89	VOA	<5.00E+00
Trichloromethane	50883	1/16/90	VOA	<5.00E+00
Trichloromethane	50883B	1/16/90	VOA	8.00E+00
Trichloromethane	50883T	1/16/90	VOA	7.00E+00
Trichloromethane	50887	1/17/90	VOA	<5.00E+00
Trichloromethane	50887B	1/17/90	VOA	<5.00E+00
Trichloromethane	50887T	1/17/90	VOA	5.00E+00
Trichloromethane	50899	1/24/90	VOA	<5.00E+00
Trichloromethane	50899B	1/24/90	VOA	<5.00E+00
Trichloromethane	50899T	1/24/90	VOA	<5.00E+00
Trichloromethane	51016	3/06/90	VOA	<5.00E+00
Trichloromethane	51016B	3/06/90	VOA	<5.00E+00
Trichloromethane	51016T	3/06/90	VOA	<5.00E+00
Trichloromethane	51075	3/20/90	VOA	<5.00E+00
Trichloromethane	51075B	3/20/90	VOA	<3.00E+00
Trichloromethane	51075T	3/20/90	VOA	<5.00E+00
Unknown aliphatic HC	51016T	3/06/90	VOA	7.00E+00
Alkalinity (Method B)	50792	11/27/89	TITRA	5.60E+04
Alkalinity (Method B)	50883	1/16/90	TITRA	5.70E+04
Alkalinity (Method B)	50887	1/17/90	TITRA	5.60E+04
Alkalinity (Method B)	50899	1/24/90	TITRA	5.70E+04
Alkalinity (Method B)	51016	3/06/90	TITRA	4.70E+04
Alkalinity (Method B)	51075	3/20/90	TITRA	5.80E+04
Alpha Activity (pCi/L)	50792	11/27/89	Alpha	2.91E+00
Alpha Activity (pCi/L)	50883	1/16/90	Alpha	9.92E+00
Alpha Activity (pCi/L)	50887	1/17/90	Alpha	7.72E+00
Alpha Activity (pCi/L)	50899	1/24/90	Alpha	4.18E+00
Alpha Activity (pCi/L)	51016	3/06/90	Alpha	2.18E+00
Alpha Activity (pCi/L)	51075	3/20/90	Alpha	5.40E+00
Beta Activity (pCi/L)	50792	11/27/89	Beta	6.85E+01
Beta Activity (pCi/L)	50883	1/16/90	Beta	2.28E+02
Beta Activity (pCi/L)	50887	1/17/90	Beta	2.26E+02
Beta Activity (pCi/L)	50899	1/24/90	Beta	9.34E+01
Beta Activity (pCi/L)	51016	3/06/90	Beta	3.54E+01
Beta Activity (pCi/L)	51075	3/20/90	Beta	3.04E+02
Conductivity (μS)	50792	11/27/89	COND-Fld	1.49E+02
Conductivity (μS)	50883	1/16/90	COND-Fld	1.41E+02
Conductivity (μS)	50887	1/17/90	COND-Fld	1.51E+02
Conductivity (μS)	50899	1/24/90	COND-Fld	1.41E+02
Conductivity (μS)	51016	3/06/90	COND-Fld	1.21E+02
Conductivity (μS)	51075	3/20/90	COND-Fld	1.29E+02
Ignitability (°F)	50792E	11/27/89	IGNIT	2.12E+02
Ignitability (°F)	50883E	1/16/90	IGNIT	2.10E+02
Ignitability (°F)	50887E	1/17/90	IGNIT	2.12E+02

Table B-1. Present Steam Condensate Sample Results. (sheet 7 of 10)

Constituent	Sample #	Date	Method	Result
Ignitability (°F)	50899E	1/24/90	IGNIT	2.10E+02
Ignitability (°F)	51016E	3/06/90	IGNIT	2.06E+02
Ignitability (°F)	51075E	3/20/90	IGNIT	2.12E+02
pH (dimensionless)	50792	11/27/89	PH-Fld	7.20E+00
pH (dimensionless)	50883	1/16/90	PH-Fld	7.40E+00
pH (dimensionless)	50887	1/17/90	PH-Fld	7.50E+00
pH (dimensionless)	50899	1/24/90	PH-Fld	7.37E+00
pH (dimensionless)	51016	3/06/90	PH-Fld	7.60E+00
pH (dimensionless)	51075	3/20/90	PH-Fld	8.09E+00
Reactivity Cyanide (mg/kg)	50792E	11/27/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50883E	1/16/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50887E	1/17/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50899E	1/24/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	51016E	3/06/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	51075E	3/20/90	DSPEC	<1.00E+02
Reactivity Sulfide (mg/kg)	50792E	11/27/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50883E	1/16/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50887E	1/17/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50899E	1/24/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	51016E	3/06/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	51075E	3/20/90	DTITRA	<1.00E+02
TDS	50792	11/27/89	TDS	6.20E+04
TDS	50883	1/16/90	TDS	5.90E+04
TDS	50887	1/17/90	TDS	6.00E+04
TDS	50899	1/24/90	TDS	6.40E+04
TDS	51016	3/06/90	TDS	5.60E+04
TDS	51075	3/20/90	TDS	7.40E+04
Temperature (°C)	50792	11/27/89	TEMP-Fld	2.00E+01
Temperature (°C)	50883	1/16/90	TEMP-Fld	2.03E+01
Temperature (°C)	50887	1/17/90	TEMP-Fld	2.10E+01
Temperature (°C)	50899	1/24/90	TEMP-Fld	2.37E+01
Temperature (°C)	51016	3/06/90	TEMP-Fld	2.07E+01
Temperature (°C)	51075	3/20/90	TEMP-Fld	1.04E+01
TOC	50792	11/27/89	TOC	<1.30E+03
TOC	50883	1/16/90	TOC	<1.00E+03
TOC	50887	1/17/90	TOC	<1.00E+03
TOC	50899	1/24/90	TOC	<1.00E+03
TOC	51016	3/06/90	TOC	<9.00E+02
TOC	51075	3/20/90	TOC	1.20E+03
Total Carbon	50792	11/27/89	TC	1.52E+04
Total Carbon	50883	1/16/90	TC	1.25E+04
Total Carbon	50887	1/17/90	TC	1.24E+04
Total Carbon	50899	1/24/90	TC	1.24E+04
Total Carbon	51016	3/06/90	TC	1.35E+04
Total Carbon	51075	3/20/90	TC	1.59E+04

Table B-1. Present Steam Condensate Sample Results. (sheet 8 of 10)

Constituent	Sample #	Date	Method	Result
TOX (as Cl)	50792	11/27/89	LTOX	<7.00E+00
TOX (as Cl)	50883	1/16/90	LTOX	<4.00E+00
TOX (as Cl)	50887	1/17/90	LTOX	<5.00E+00
TOX (as Cl)	50899	1/24/90	LTOX	1.20E+01
TOX (as Cl)	51016	3/06/90	LTOX	<4.00E+00
TOX (as Cl)	51075	3/20/90	LTOX	<5.00E+00
^{241}Am (pCi/L)	50792	11/27/89	AEA	3.17E-01
^{241}Am (pCi/L)	50883	1/16/90	AEA	4.87E-01
^{241}Am (pCi/L)	50887	1/17/90	AEA	5.60E-01
^{241}Am (pCi/L)	50899	1/24/90	AEA	1.76E-01
^{241}Am (pCi/L)	51016	3/06/90	AEA	9.62E-02
^{241}Am (pCi/L)	51075	3/20/90	AEA	1.60E+00
^{144}Ce/Pr (pCi/L)	50883	1/16/90	GEA	2.43E+02
^{144}Ce/Pr (pCi/L)	50887	1/17/90	GEA	2.64E+02
^{144}Ce/Pr (pCi/L)	50899	1/24/90	GEA	9.15E+01
^{144}Ce/Pr (pCi/L)	51016	3/06/90	GEA	4.35E+01
^{144}Ce/Pr (pCi/L)	51075	3/20/90	GEA	4.69E+02
^{137}Cs (pCi/L)	50792	11/27/89	GEA	2.34E+00
^{137}Cs (pCi/L)	50883	1/16/90	GEA	2.20E+01
^{137}Cs (pCi/L)	50887	1/17/90	GEA	1.65E+01
^{137}Cs (pCi/L)	50899	1/24/90	GEA	1.74E+01
^{137}Cs (pCi/L)	51016	3/06/90	GEA	7.85E-01
^{137}Cs (pCi/L)	51075	3/20/90	GEA	<2.43E+00
^{238}Pu (pCi/L)	50792	11/27/89	AEA	2.02E-01
^{238}Pu (pCi/L)	50883	1/16/90	AEA	4.60E-01
^{238}Pu (pCi/L)	50887	1/17/90	AEA	5.48E-01
^{238}Pu (pCi/L)	50899	1/24/90	AEA	3.45E-01
^{238}Pu (pCi/L)	51016	3/06/90	AEA	2.41E-01
^{238}Pu (pCi/L)	51075	3/20/90	AEA	7.60E-01
^{239,240}Pu (pCi/L)	50792	11/27/89	AEA	2.33E+00
^{239,240}Pu (pCi/L)	50883	1/16/90	AEA	6.32E+00
^{239,240}Pu (pCi/L)	50887	1/17/90	AEA	6.94E+00
^{239,240}Pu (pCi/L)	50899	1/24/90	AEA	4.40E+00
^{239,240}Pu (pCi/L)	51016	3/06/90	AEA	3.07E+00
^{239,240}Pu (pCi/L)	51075	3/20/90	AEA	9.88E+00
Radium Total (pCi/L)	50792	11/27/89	Alpha-Ra	6.05E-01
Radium Total (pCi/L)	50883	1/16/90	Alpha-Ra	1.82E-01
Radium Total (pCi/L)	50887	1/17/90	Alpha-Ra	1.59E-01
Radium Total (pCi/L)	50899	1/24/90	Alpha-Ra	2.01E-01
Radium Total (pCi/L)	51016	3/06/90	Alpha-Ra	9.10E-01
Radium Total (pCi/L)	51075	3/20/90	Alpha-Ra	1.00E+01
^{90}Sr (pCi/L)	50792	11/27/89	Beta	7.76E-01
^{90}Sr (pCi/L)	50883	1/16/90	Beta	6.99E+00
^{90}Sr (pCi/L)	50887	1/17/90	Beta	1.50E+00
^{90}Sr (pCi/L)	50899	1/24/90	Beta	4.93E-01
^{90}Sr (pCi/L)	51016	3/06/90	Beta	1.79E-01

Table B-1. Present Steam Condensate Sample Results. (sheet 9 of 10)

Constituent	Sample #	Date	Method	Result
^{90}Sr (pCi/L)	51075	3/20/90	Beta	<6.01E-01
^{234}U (pCi/L)	50792	11/27/89	AEA	2.02E-01
^{234}U (pCi/L)	50883	1/16/90	AEA	1.84E-01
^{234}U (pCi/L)	50887	1/17/90	AEA	2.01E-01
^{234}U (pCi/L)	50899	1/24/90	AEA	2.94E-01
^{234}U (pCi/L)	51016	3/06/90	AEA	2.22E-01
^{234}U (pCi/L)	51075	3/20/90	AEA	2.99E-01
^{238}U (pCi/L)	50792	11/27/89	AEA	1.71E-01
^{238}U (pCi/L)	50883	1/16/90	AEA	1.92E-01
^{238}U (pCi/L)	50887	1/17/90	AEA	1.01E-01
^{238}U (pCi/L)	50899	1/24/90	AEA	1.69E-01
^{238}U (pCi/L)	51016	3/06/90	AEA	1.27E-01
^{238}U (pCi/L)	51075	3/20/90	AEA	1.82E-01

Sample# is the number of the sample. See Section 3.0 for corresponding chain-of-custody number. Date is the sampling date. Results are in ppb (parts per billion) unless otherwise indicated. The following table lists the methods that are coded in the method column.

Code	Analytical Method	Reference
ABN	Semivolatile Organics (GC/MS)	USEPA-8270
AEA	^{241}Am	UST-20Am01
AEA	Curium Isotopes	UST-20Am/Cm01
AEA	Plutonium Isotopes	UST-20Pu01
AEA	Uranium Isotopes	UST-20U01
ALPHA	Alpha Counting	EPA-680/4-75/1
ALPHA-Ra	Total Radium Alpha Counting	ASTM-D2460
BETA	Beta Counting	EPA-680/4-75/1
BETA	^{90}Sr	UST-20Sr02
COLIF	Coliform Bacteria	USEPA-9131
COLIFMF	Coliform Bacteria (Membrane Filter)	USEPA-9132
COND-Fld	Conductivity-Field	ASTM-D1125A
COND-Lab	Conductivity-Laboratory	ASTM-D1125A
CVAA	Mercury	USEPA-7470
CVAA/M	Mercury-Mixed Matrix	USEPA-7470
DIGC	Direct Aqueous Injection (GC)	UST-70DIGC
DIMS	Direct Aqueous Injection (GC/MS)	"USEPA-8240"
DSPEC	Reactive Cyanide (Distillation, Spectroscopy)	USEPA-CHAPTER 7
DTITRA	Reactive Sulfide (Distillation, Titration)	USEPA-CHAPTER 7
FLUOR	Uranium (Fluorometry)	ASTM-D2907-83
GEA	Gamma Energy Analysis Spectroscopy	ASTM-D3649-85
GFAA	Arsenic (AA, Furnace Technique)	USEPA-7060
GFAA	Lead (AA, Furnace Technique)	USEPA-7421

Table B-1. Present Steam Condensate Sample Results. (sheet 10 of 10)

Code	Analytical Method	Reference
GFAA	Selenium (AA, Furnace Technique)	USEPA-7740
GFAA	Thallium (AA, Furnace Technique)	USEPA-7841
IC	Ion Chromatography	EPA-600/4-84-01
ICP	Atomic Emission Spectroscopy (ICP)	USEPA-6010
ICP/M	Atomic Emission Spectroscopy (ICP)-Mixed Matrix	USEPA-6010
IGNIT	Pensky-Martens Closed-Cup Ignitability	USEPA-1010
ISE	Fluoride-Low Detection Limit	ASTM-D1179-80-B
ISE	Ammonium Ion	ASTM-D1426-D
LALPHA	Alpha Activity-Low Detection Limit	EPA-680/4-75/1
LEPD	^{129}I	UST-20I02
LSC	^{14}C	UST-20C01
LSC	Tritium	UST-20H03
LTOX	Total Organic Halides-Low Detection Limit	USEPA-9020
PH-Fld	pH-Field	USEPA-9040
PH-Lab	pH-Laboratory	USEPA-9040
SPEC	Total and Amenable Cyanide (Spectroscopy)	USEPA-9010
SPEC	Hydrazine-Low Detection Limit (Spectroscopy)	ASTM-D1385
SOLID	Suspended Solids	SM-208D
TC	Total Carbon	USEPA-9060
TDS	Total Dissolved Solids	SM-208B
TEMP-Fld	Temperature-Field	Local
TITRA	Alkalinity-Method B (Titration)	ASTM-D1067B
TITRA	Sulfides (Titration)	USEPA-9030
TOC	Total Organic Carbon	USEPA-9060
TOX	Total Organic Halides	USEPA-9020
VOA	Volatile Organics (GC/MS)	USEPA-8240

Analytical Method Acronyms:
AA = atomic absorption spectroscopy.
GC = gas chromatography.
MS = mass spectrometry.
ICP = inductively-coupled plasma spectroscopy.

References:

ASTM--"1986 Annual Book of ASTM Standards," American Society for Testing and Materials, Philadelphia, Pennsylvania.

EPA--Various methods of the U.S. Environmental Protection Agency, Washington, D.C.

UST--Methods of the United States Testing Company, Incorporated, Richland, Washington.

SM--"Standard Methods for the Examination of Water and Wastewater," 16th ed., American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, D.C.

USEPA--"Test Methods for Evaluating Solid Waste Physical/Chemical Methods," 3rd ed., SW-846, U.S. Environmental Protection Agency, Washington, D.C.

APPENDIX C

HISTORICAL SAMPLE DATA

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Table C-1. Historical PUREX Steam Condensate Chemical Sample Results.

ANALYTE	08/22/85	06/03/86	08/12/86	11/18/86	03/17/87
Alpha Activity (LDL, pCi/L)	7.71E-01	1.41E+00	9.97E-01	4.78E+00	7.75E+00
Beta Activity (pCi/L)	8.46E+01	7.00E+01	6.49E+03	4.96E+01	2.31E+02
Barium	2.40E+01	1.70E+01	2.00E+01	3.00E+01	2.20E+01
Cadmium	5.00E+00	BDL	BDL	BDL	BDL
Calcium	1.49E+04	1.06E+04	1.16E+04	1.97E+04	1.79E+04
Chloride	8.40E+02	BDL	5.59E+02	7.81E+02	1.09E+03
Conductivity-Field (µS)	1.08E+02	8.54E+00	4.94E+02	1.37E+02	1.09E+02
Copper	BDL	1.00E+01	BDL	BDL	BDL
Cyanide	1.78E+01	BDL	BDL	BDL	BDL
Iron	5.50E+01	5.50E+01	7.60E+01	BDL	BDL
Magnesium	3.38E+03	2.42E+03	2.63E+03	4.45E+03	4.08E+03
Manganese	1.10E+01	7.00E+00	1.00E+01	BDL	7.00E+00
Nickel	1.76E+01	BDL	BDL	BDL	BDL
Nitrate	2.46E+03	BDL	1.22E+03	1.94E+03	BDL
pH-Field	7.43E+00	6.60E+00	5.80E+00	5.15E+00	5.30E+00
Potassium	6.14E+02	5.60E+02	5.05E+02	8.12E+02	7.04E+02
Sodium	2.20E+03	1.91E+03	1.45E+03	2.24E+03	2.05E+03
Sulfate	7.81E+03	5.97E+03	5.70E+03	1.08E+04	1.11E+04
Temperature-Field (°C)	3.98E+01	4.65E+01	4.44E+01	1.35E+01	1.59E+01
TOC	1.16E+03	1.70E+03	1.06E+03	1.09E+03	1.15E+03
TOC		1.75E+03			
TOX (LDL)	BDL	BDL	BDL	2.05E+01	BDL
Uranium	4.46E-01	1.51E-01	3.85E-01	4.61E-01	3.70E-01
Zinc	3.20E+01	5.60E+01	6.00E+00	6.00E+00	1.00E+01
Unknown aliphatic HC	BDL	BDL	BDL	BDL	3.50E+01

All units are in parts per billion unless indicated otherwise.
BDL = below detection limit.
LDL = low detection limit.
HC = hydrocarbon.

Radioactive Component Analysis Considerations

Understanding the radiological sample results generated routinely at the Hanford Site is complicated by the traditional methods of reporting the results. These methods, although not ideal, are a direct outgrowth of the methods used to detect radionuclides, the physics of radioactive decay, and the ubiquity of ionizing radiation.

Radioactive decay is a random process: each radioactive nucleus has a certain probability of decaying during a certain period of time, and will either decay or not decay. Radioactivity is quantified by counting the number of decays observed during a measured period of time. Consequently, any measurement of the radioactive decay rate includes a considerable amount of random error (experimental uncertainty). Specifically, the standard deviation of a measurement is equal to the square root of the number of decays expected during the counting period. The standard deviation can be approximated as the square root of the number of counts actually observed. Background radiation, which is always present, follows the same statistical rules as the radioactivity being measured.

To avoid reporting background radiation as radioactivity in a sample, each analysis consists of two counting periods of the same length. In the first, the background radiation is counted. In the second, the sample to be analyzed is inserted into the instrument, and the background and sample are counted together. The measured radioactivity of the sample is the difference between the second and first measurements, divided by the time period. Because the radiation production is a random process, it is possible for an individual measurement of the background to be greater than another measurement of the background plus the radioactivity of a sample, leading to a negative measured radioactivity for the sample. (Indeed, if the sample has negligible radioactivity, such negative results will occur about half of the time.)

Because it is physically impossible for a sample to actually contain a negative concentration of radioactive species, negative results have traditionally been reported as "less than" values. Similarly, counting results so low as to make it unclear whether any radioactivity was present in the sample have also often been reported as "less than" values. On some occasions, however, small positive results (below the confidence interval reported in "less than" results) have been reported as real numbers. Although the historical data resulting from such reporting methods are not as well suited as they might be for evaluating what has happened in the past, the data did serve their primary function for process control and environmental protection at the time they were generated.

Radiological Surveillance Results

The following tables present available radiological data on SCD discharges from 1961 through September 1989. The data were obtained from monthly composite samples of the effluent actually released to the environment. The samples were obtained by a flow proportional sampler, and composited monthly using data from the SCD flow instrumentation. Except for the preliminary 1989 results, the data have been published on a yearly or quarterly basis, and made available to the public. Except for the preliminary 1989 results, the data have also been published in Volume 2 of the *Waste Stream Characterization Report* (WHC 1989).

At the end of 1984, a change was made in the reporting of plutonium in liquid effluents released to the environment. Before that time, plutonium releases were reported in grams per liter. Subsequent to that time, they were reported in microcuries per liter. In producing the following table, the reported concentrations after 1984 were multiplied by 1,000,000 to yield picocuries per liter (pCi/L) and micrograms per liter before 1985. The pre-1985 plutonium results can be converted to picocuries per liter by multiplying by the specific activity of ^{239}Pu, which is 61,400 pCi/μg.

The graphs that follow the tables present the same data in graphic form. In the graphs, both "less than" results and real results are connected with lines. Each real result is marked with a plus sign. Thus, the graph for ^{241}Am (page C-25) shows only an upper bound for the actual emissions of ^{241}Am through the SCD (all of the data are "less than" results). Similarly, the graph for ^{144}Ce (page C-20) shows only two instances in which ^{144}Ce was actually detected in the SCD (January 1989 and May 1989). The rest of the line on the ^{144}Ce graph is merely an upper bound for the actual emissions of ^{144}Ce through the SCD. In the graphical presentation the plutonium data are all in picocuries per liter.

When the SCD is diverted and subsequently found acceptable for release to a surface pond, the radionuclide content of the released liquid is sometimes included in the total for the CSL, instead of the SCD. Consequently, the historical radiological data do not reflect the composition and variability of the SCD as accurately as they might.

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 1 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	VOLUME	ALPHA	BETA	SR-90	RU-106	CS-137	CE-144	PM-147	CO-60	U(GROSS)
6112	3.18E+08	1.23E+05	3.03E+09	7.92E+07	9.14E+07	1.31E+08			9.50E+06	7.66E+02
6212	4.89E+08	2.46E+06	7.72E+08	2.01E+07	2.32E+07	3.33E+07			2.40E+06	3.33E+03
6312	3.91E+08	1.23E+05	2.24E+08	5.90E+06	6.80E+06	9.70E+06			7.00E+05	5.99E+02
6412	4.58E+08	1.23E+05	2.09E+08	5.40E+06	6.30E+06	9.00E+06			7.00E+05	5.99E+02
6512	4.82E+08	1.84E+05	3.32E+08	8.70E+06	1.00E+07	1.43E+07			1.00E+06	2.43E+03
6612	2.59E+08	6.14E+04	8.03E+07	6.00E+05	7.70E+06	1.70E+06			4.00E+05	6.66E+01
6712	1.85E+08	5.53E+05	2.04E+08	1.40E+06	6.40E+06	1.30E+06			4.00E+05	1.29E+03
6812	1.48E+08	<2.70E+05	1.97E+07	2.80E+06	4.20E+06	1.30E+06			3.00E+05	5.29E+02
6912	1.22E+08	6.14E+04	1.71E+08	6.50E+06	6.80E+06	7.20E+06			8.00E+05	2.15E+02
7012	1.81E+08	<6.14E+04	8.31E+07	3.40E+06	9.10E+06	4.20E+06			2.00E+05	<5.43E+02
7112	<2.63E+08	<1.75E+05	1.17E+08	3.60E+06	1.80E+06	1.80E+05			1.00E+05	<2.34E+03
7212	<1.81E+08	<1.46E+05	1.91E+08	4.92E+07	2.24E+07	4.81E+06			<9.23E+05	<6.33E+02
7312	<8.61E+07	<1.00E+05	2.89E+06	4.35E+05	2.40E+05	2.43E+05			<1.12E+04	<2.61E+02
7604	2.70E+06		9.00E+01							9.60E+01
7605	3.20E+06		9.00E+01							<3.80E+01
7606	2.60E+06		<5.10E+01							<3.84E+01
7607	2.40E+06		<4.26E+01							<3.85E+01
7608	3.20E+06		<3.06E+01							<3.86E+01
7609	2.70E+06		<3.32E+01							<3.87E+01
7610	2.80E+06		<3.48E+01							<3.85E+01
7611	2.60E+06		<1.34E+01							<3.85E+01
7612	2.78E+06		2.95E+01							<3.85E+01
7701	2.80E+06		<5.00E+01							<3.85E+01
7702	2.50E+06		<2.79E+01							3.85E+01
7703	2.70E+06		<2.28E+02							<4.18E+01
7704	2.60E+06		<2.92E+02							<3.85E+01
7705	2.90E+06		5.62E+04							<3.85E+01
7706	2.20E+06		1.03E+03							<3.84E+01
7707	2.65E+06		<5.50E+02							<3.85E+01
7708	2.80E+06		6.44E+01							<3.84E+01
7709	2.95E+06		<2.33E+01							<3.85E+01
7710	2.50E+06		1.69E+02							<3.85E+01
7711	2.64E+06		<5.04E+01							<3.84E+01
7712	2.69E+06		2.27E+04	5.05E+03	<1.00E+04	<4.20E+02	<1.30E+03		<6.00E+03	<3.85E+01
7801	2.90E+06		2.29E+04	9.70E+03						<3.85E+01
7802	2.01E+06		2.07E+04							<3.99E+01
7803	2.81E+06		1.65E+02							<3.85E+01
7804	2.80E+06		1.52E+02							<3.85E+01
7805	2.90E+06		9.44E+01							<3.85E+01
7806	2.60E+06		2.68E+02							<1.09E+02
7807	2.60E+06		4.82E+03							<3.85E+01
7808	3.40E+06		1.06E+02							3.84E+01
7809	2.70E+06		<3.91E+03							<3.84E+01
7810	3.10E+06		<1.09E+02							<3.82E+01
7811	2.80E+06		<8.67E+01							<3.82E+01

9 1 1 1 2 5 0 1 2 2

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 2 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	VOLUME	ALPHA	BETA	SR-90	RU-106	CS-137	CE-144	PM-147	CO-60	U(GROSS)
7812	2.70E+06		<9.46E+01							
7901	1.93E+07		2.00E+01							<1.00E+03
7902	1.55E+07		<2.85E+01							<1.00E+03
7903	1.59E+07		<1.46E+01							<1.00E+03
7904	1.48E+07		1.07E+00							<1.00E+03
7905	1.51E+07		7.58E+01	3.08E+02		<4.10E+03				<1.00E+03
7906	9.84E+06			<1.41E+01						<1.00E+03
7907	9.84E+06		<5.60E+00							<1.10E+03
7908	1.21E+07		<1.50E+01							<1.00E+03
7909	9.84E+06		<1.63E+01							<1.00E+03
7910	1.25E+07		<1.78E+01							<1.00E+03
7911	1.02E+07		3.04E+01							<1.00E+03
7912	1.25E+07		<5.92E+01	<1.10E+01		<6.80E+01				<1.00E+03
8001	8.33E+06		1.18E+03	6.27E+02		1.20E+02				
8002	4.54E+06		5.37E+01	7.18E+01						
8003	4.54E+06		<3.32E+01	<1.00E+01		<3.80E+01				
8004	6.06E+06		5.25E+01	<1.60E+01		<3.80E+01				
8005	5.30E+06		<1.29E+01	<9.00E+00		<3.80E+01				
8006	5.68E+06		<1.29E+01	1.90E+02		4.00E+01				
8007	6.81E+06		4.60E+01	<1.00E+01		<4.00E+01				
8008	6.44E+06		4.81E+01	<2.00E+01		<4.00E+01				
8009	7.57E+06		1.50E+01	1.80E+01		<4.00E+01				
8010	3.80E+06		<9.00E+00	<8.33E+00		<4.00E+01				
8011	1.10E+07		2.00E+03	5.80E+02		1.20E+02				
8012	1.40E+07		2.01E+03	8.70E+02		<4.00E+01				
8101	1.08E+07		7.50E+01	3.40E+01		1.70E+02				
8102	1.08E+07		1.20E+01	<2.00E+01		1.70E+02				
8103	9.69E+06		5.87E+00	<9.00E+00		<4.00E+01				
8104	1.26E+07		1.25E+00	<5.00E+00		<4.00E+01				
8105	6.06E+06		5.70E+01	2.60E+01		<4.00E+01				
8106	3.33E+07		2.51E+03	6.80E+02		<4.00E+01				
8107	1.28E+07		5.30E+01	2.00E+01		4.00E+01				
8108	9.83E+06		9.20E+01	3.00E+01		<4.00E+01				
8109	1.25E+07		2.53E+02	7.50E+01		<4.00E+01				
8110	1.03E+07		1.70E+01	<2.00E+01		<4.00E+01				
8111	1.04E+07		1.50E+03	5.20E+02		2.70E+02				
8112	1.31E+07		1.30E+03	2.80E+02		1.70E+02				
8201	1.09E+07	6.20E+01	5.24E+02							
8202	1.26E+07	3.20E+00	2.44E+01							
8203	1.42E+07	<2.20E+00	<1.12E+01							
8204	1.12E+07	<8.80E+00	7.23E+02	2.40E+02		2.50E+02				
8205	1.13E+07	<5.70E+00	<2.20E+01							
8206	1.39E+07	<1.80E+01	<1.07E+02	<1.00E+01		1.60E+02				
8207	9.73E+06	<4.50E+00	1.55E+01							
8208	1.34E+07	2.41E+00	<1.65E+01							

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Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 3 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	VOLUME	ALPHA	BETA	SR-90	RU-106	CS-137	CE-144	PM-147	CO-60	U(GROSS)
8209	1.30E+07	<1.49E+00	<1.60E+01							
8210	3.13E+07	2.80E+00	1.40E+03	5.00E+02		3.90E+01				
8211	1.12E+07	6.60E+01	7.63E+02	1.40E+02		3.60E+01				
8212	2 17E+07	1.38E+01	3.38E+03	1.30E+03		3.30E+02				
8301	1.66E+07	1.57E+01	4.50E+02	4.70E+01		2.10E+02				
8302	2.20E+07	<4.70E+00	<2.12E+02	<1.00E+01		1.20E+02				
8303	2.06E+07	<1.41E+01	<1.20E+02	9.60E+00		5.80E+01				
8304	1.37E+07	<2.20E+00	7.00E+01	<1.00E+01		5.40E+01				<1.00E+00
8305	2.37E+07	<1.90E+01	1.11E+02	<1.00E+01		6.00E+01				
8306	2.14E+07	<5.40E+00	2.00E+02	<2.00E+01		1.60E+02				
8307	1.13E+07	<8.49E+00	<8.70E+01	1.40E+01		<5.00E+01				
8308	1.37E+07	4.70E+00	2.85E+02	7.80E+01		1.20E+02				
8309	1.11E+07	4.50E+02	5.55E+02	1.10E+02		2.20E+02				<1.00E+00
8310	1.70E+07	4.07E+02	2.30E+02							
8311	3.03E+07	8.80E+01	<2.00E+02	2.30E+01		7.10E+01				1.10E+01
8312	2.13E+07	3.80E+01	2.58E+02	1.10E+01		<6.00E+01				<1.00E+00
8401	2.17E+07	9.00E+01	1.68E+02	7.30E+01		<6.70E+01				
8402	3.07E+07	8.80E+01	6.90E+01	<1.30E+01		<1.40E+02				
8403	3.06E+07	<2.00E+01	4.96E+02	2.00E+02		<6.74E+01				<1.00E+00
8404	3.06E+07	<1.17E+01	1.42E+03	3.92E+02		9.80E+01		<1.80E+02		<1.00E+00
8405	3.01E+07	2.66E+02	4.87E+02	8.91E+01		1.60E+02		<2.00E+02		<1.00E+00
8406	2.77E+07	<6.50E+00	1.96E+02	<4.20E+01		<5.80E+01				1.50E+01
8407	4.73E+07	<5.10E+00	1.55E+02	<1.90E+01		<4.30E+01				<1.00E+02
8408	7.46E+07	<1.90E+01	8.70E+02	<4.80E+01		<4.00E+01		<9.00E+01		<6.00E+01
8409	3.92E+07	<1.40E+01	8.49E+02	<2.45E+02		<6.00E+01		<4.00E+03		<1.00E+00
8410	1.21E+07	1.84E+01	2.78E+01	<4.00E+01		<4.70E+01		<3.00E+03		<2.00E+00
8411	3.79E+07	5.20E+00	2.13E+03	2.10E+02		3.66E+02		<4.00E+03		<1.00E+00
8412	5.27E+07	<5.65E+01	8.49E+02	<2.90E+01		1.18E+02		<4.00E+02		<1.00E+00
8501	8.15E+07	<1.40E+01	1.00E+03	<3.80E+01		1.25E+02		<4.00E+02		<1.78E+00
8502	6.40E+07	<1.93E+01	1.26E+03	<3.00E+01		1.54E+02		<7.00E+02		<1.60E+00
8503	6.17E+07	<2.90E+00	1.77E+02	<3.00E+01		<4.40E+01		<4.00E+01		<1.42E+00
F504	8.16E+07	<2.10E+00	3.74E+01	<1.93E+01		<5.00E+01		<3.60E+02		<[illegible].79E-01
8505	7.21E+07	<2.60E+00	1.86E+02	2.00E+01		<4.40E+01		<3.00E+02		7.83E-01
8506	6.72E+07	<5.60E+00	4.91E+02	8.50E+01		5.20E+01		1.20E+02		3.60E+00
8507	1.02E+08	<4.80E+00	5.02E+02	<2.20E+01		<4.60E+01		4.40E+02		<1.78E+00
8508	7.92E+07	<4.40E+00	2.51E+02	<5.40E+01		<4.20E+01		2.40E+02		<3.56E+01
8509	6.84E+07	<2.40E+00	1.71E+03	3.57E+02		<4.21E+01		3.40E+02		<4.77E+01
8510	6.51E+07	<7.80E+01	1.60E+04	4.40E+03		2.24E+03		8.30E+02		<4.46E+01
8511	6.95E+07	<3.70E+00	1.21E+03	1.99E+02		5.43E+02		<4.00E+01		<7.13E-01
8512	7.07E+07	<8.30E+00	6.30E+02	<4.00E+01		3.28E+02		8.30E+01		<4.90E-01
8601	8.19E+07	2.69E+01	4.54E+02	<2 00E+01		1.22E+02				
8602	7.66E+07	5.30E+01	3.65E+03	3.17E+02		2.03E+02				
8603	7.31E+07	<4.20E+00	6.73E+02	<4.20E+01		1.82E+02				
8604	8.95E+07	1.44E+01	5.39E+02	6.10E+01		2.30E+02				
8605	6.63E+07	8.50E+00	7.19E+02	<3.60E+01		2.18E+02				

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 4 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX St· m Condensate

Date	VOLUME	ALPHA	BETA	SR-90	RU-106	CS-137	CE-144	PM-147	CO-60	U(GROSS)
8606	6.95E+07	<1.30E+01	5.25E+02	1.10E+01		7.40E+01				
8607	1.03E+08	<7.60E+00	4.65E+03	5.29E+02		1.65E+02				
8608	7.47E+07	<4.07E+01	4.38E+04	3.92E+03		1.51E+03				
8609	4.72E+07	4.30E+02	9.60E+03	8.60E+02		3.21E+02				
8610	3.22E+07	1.10E+02	2.35E+03	<2.10E+02		2.76E+02				
8611	1.08E+07	3.70E+01	1.05E+03	<2.00E+01		<1.10E+02				
8612	4.00E+07	1.05E+02	1.23E+03	<2.90E+01		1.04E+02				
8701	2.76E+07	1.30E+02	9.70E+02	6.70E+01		7.30E+01				
8702	3.49E+07	4.05E+02	5.70E+03	4.90E+01		1.03E+02				
8703	7.19E+07	1.73E+02	4.14E+03	<4.60E+01		5.10E+01				
8704	8.25E+07	3.50E+01	3.07E+03	3.10E+01		4.60E+01				
8705	5.17E+07	<6.40E+01	<2.10E+03	4.60E+01		6.40E+01				
8706	7.17E+07	5.60E+01	1.80E+03	<1.60E+01		<5.35E+01				
8707	7.45E+07	4.45E+01	2.05E+03	<2.55E+01		6.97E+01				
8708	7.77E+07	1.66E+01	1.57E+03	8.22E+01		1.55E+02				
8709	5.16E+07	8.40E+01	8.05E+03	<2.51E+01		2.75E+02				
8710	1.69E+07	1.67E+02	4.34E+03	<1.81E+01		1.14E+02				
8711	1.51E+07	2.51E+02	5.15E+03	<4.46E+01		1.52E+02				
8712	1.67E+07	<5.54E+00	<1.04E+02	<2.24E+01		<4.82E+01				
8801	3.44E+06	<3.33E+02	<2.32E+04	<3.26E+01		5.62E+02				
8802	5.25E+06	1.72E+01	4.61E+03	4.04E+02		4.06E+02				
8803	6.99E+06	1.09E+01	1.03E+03	<7.49E+01		1.03E+02				
8804	4.21E+06	6.35E+00	4.15E+02	<2.00E+01		6.65E+01				
8805	6.20E+06	5.05E+00	4.04E+02	<1.47E+01		<4.92E+01				
8806	9.36E+06	1.47E+01	7.89E+02	<3.02E+01		5.84E+02				
8807	6.53E+07	1.36E+01	5.08E+02	<7.33E+01		<8.17E+01				
8808	8.69E+07	3.99E+01	5.52E+03	9.28E+02		<1.79E+02				
8809	6.13E+07	<8.34E+00	1.62E+03	<5.53E+01		<1.58E+02				
8810	4.54E+07	3.93E+00	1.27E+03	1.74E+02		7.80E+01				
8811	5.17E+07	<5.01E+00	1.75E+03	6.81E+02		<7.09E+01				
8812	2.77E+07	9.15E+00	1.81E+03	<1.81E+01		<5.30E+01				

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 5 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	H-3	AM-241	PU-238
7604			5.10E-04
7605			5.10E-04
7606			<1.50E-04
7607			8.48E-04
7608			<6.19E-05
7609			<1.32E-04
7610			9.97E-05
7611			<4.22E-05
7612			1.67E-04
7701			1.32E-05
7702			1.46E-04
7703			<1.04E-03
7704			<6.01E-04
7705			8.32E-02
7706			1.36E-02
7707			<6.55E-03
7708			1.07E-02
7709			5.80E-03
7710			3.73E-03
7711			1.49E-02
7712			3.73E-03
7801			2.25E-03
7802			1.73E-01
7803			1.73E-03
7804			2.15E-03
7805			1.60E-04
7806			3.22E-03
7807			4.56E-04
7808			<1.25E-03
7809			3.99E-04
7810			4.72E-03
7811			<3.30E-04
7812			<7.83E-04
7901			<9.63E-04
7902			2.18E-04
7903			2.04E-04
7904			9.01E-05
7905			<1.15E-04
7906			1.01E-04
7907			<9.45E-05
7908			7.83E-05
7909			1.03E-04
7910			1.29E-04
7911			3.66E-04
7912			3.27E-04

9 1 1 1 7 5 0 1 3 6

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 6 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	H-3	AM-241	PU-239
8001			3.83E-04
8002			7.79E-05
8003			5.44E-05
8004			<1.29E-03
8005			<3.14E-05
8006			1.96E-04
8007			5.54E-04
8008			1.51E-03
8009			1.40E-04
8010			5.05E-05
8011			4.63E-05
8012			1.25E-04
8101			5.54E-05
8102			2.44E-05
8103			7.49E-05
8104			9.12E-06
8105			1.43E-05
8106			2.18E-05
8107			2.77E-05
8108			2.56E-05
8109			4.23E-05
8110			<2.85E-05
8111			4.56E-05
8112			1.50E-05
8304	<2.00E+02		
8306	2.60E+02		
8307	<2.00E+02		
8308	4.70E+02		
8309	2.30E+03		
8310	<2.00E+02		
8311	8.10E+01		
8312	8.10E+01		
8401	2.00E+03		
8402	<1.00E+00		
8403	6.30E+01		
8404	2.90E+03		
8405	8.76E+03		
8406	4.40E+04		
8407	<3.00E+02		
8408	<1.00E+02		
8409	2.50E+04		
8410	3.70E+02		
8411	3.80E+03		
8412	4.10E+03		
8501	8.80E+04		

9 1 1 1 2 9 5 0 1 2 7

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 7 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	H-3	AM-241	PU-239
8502	7.40E+04		
8503	9.80E+02		
8504	4.30E+04		
8505	9.00E+02		
8506	9.50E+02		
8507	1.50E+03		
8508	<5.00E+02		
8509	1.20E+03		
8510	4.00E+03		
8511	1.70E+04		
8512	8.70E+02		
8601	1.70E+03		
8602	4.10E+03		
8603	<1.00E+03		
8604	5.10E+04		
8605	9.60E+03		
8606	5.10E+02		
8607	4.10E+02		
8608	<2.00E+02		
8609	<3.00E+02		
8610	7.70E+02		
8611	8.20E+02		
8612	<5.00E+02		
8701	7.80E+02		
8702	1.20E+03		
8703	1.10E+03	<7.00E+02	3.10E+02
8704	3.80E+02	<6.00E+02	1.15E+02
8705	8.00E+02	<1.23E+03	9.31E+01
8706	2.98E+02	<4.13E+02	7.02E+01
8707	4.48E+03	<7.00E+01	4.69E+01
8708	5.07E+02	<8.00E+01	8.07E+01
8709	<4.50E+02	<8.00E+01	8.11E+01
8710	<4.50E+02	<9.00E+01	1.80E+02
8711	<4.50E+02	<4.64E+01	2.65E+02
8712	5.86E+02	<8.10E+01	<1.00E+01
8801	1.05E+03	<8.48E+01	6.34E+02
8802	<4.50E+02	<6.00E+01	<1.68E+01
8803	1.03E+03	<2.31E+01	<1.00E+01
8804	1.20E+03	<5.54E+01	<1.00E+01
8805	<4.50E+02	<5.15E+01	<1.00E+01
8806	6.66E+03	<4.68E+01	<1.42E+01
8807	<4.59E+02	<1.25E+02	<2.98E+01
8808	8.91E+02	<7.16E+01	<6.09E+01
8809	2.08E+03	<5.55E+01	<9.17E+01
8810	3.79E+03	<5.61E+01	<1.37E+01

Table C-2. PUREX Steam Condensate Radiological Release History. (pCi/L Except Volume in L) (sheet 8 of 8)

Crib Waste Management System
Wastestream Activity Detail
Units in pCi/L except Volume in L

Stream Code: PS PUREX Steam Condensate

Date	H-3	AM-241	PU-239
8811	6.13E+02	<5.60E+01	<1.50E+01
8812	1.40E+03	<5.34E+01	1.17E+01

Total volume: 7.49E+09

Table C-3. PUREX Steam Condensate Radiological Release History. Preliminary Results January through September 1989.

SCD (A30=67% : (A37) A-37-2=33%) for 1989

MONTH	VOLUME (L) 00	ALPHA (uCi/l) 01	BETA (uCi/l) 02	Pu-239,24 (uCi/l) 78	Am-241 (uCi/l) 26	U-gross (uCi/l) 17	Sr-89,90 (uCi/l) 03	Cs-137 (uCi/l) 08
J	4.64E+07	1.28E-05	3.26E-03	<1.76E-05	<2.04E-04	2.02E-06	<2.89E-05	<5.27E-05
F	6.31E+07	2.50E-05	1.87E-03	<2.69E-05	<2.87E-05	9.05E-07	1.46E-04	<4.98E-05
M	7.09E+07	3.71E-06	5.40E-04	<1.31E-05	<2.61E-05	2.41E-06	<1.27E-05	<5.62E-05
A	5.40E+07	1.25E-04	8.47E-04	Insuf Sam	Insuf Sa	3.01E-05	<4.98E-05	<6.22E-05
M	2.78E+07	1.16E-03	1.20E-02	5.52E-04	<4.40E-05	9.62E-04	3.04E-04	2.99E-04
J	2.14E+07	1.86E-04	1.52E-03	1.63E-04	<3.79E-05	1.03E-04	7.83E-05	1.36E-04
J	4.92E+07	4.75E-05	1.25E-03	4.07E-05	<2.70E-05	1.24E-05	4.82E-05	1.86E-04
A	3.04E+07	2.05E-05	3.00E-04	3.03E-05	<2.74E-05	4.16E-05	<1.91E-05	9.55E-05
S	2.72E+07	2.70E-05	4.79E-04	INCOMPLETE	INCOMPLETE	4.45E-07	<1.73E-05	<6.32E-05

SCD (A30=67% : (A37) A-37-2=33%) for 1989

MONTH	Pm-147 (uCi/l) 11	H-3 (uCi/l) 20	Nb-95 (uCi/l) NOPF-74	Zr-95 (uCi/l) NOPF-72	Ce/Pr-144 (uCi/l)	Ru/Rh-106 (uCi/l)
J	<9.01E-04	1.13E-03	<4.19E-05	<7.08E-05	1.11E-03	<5.36E-05
F	<9.01E-04	<4.50E-04	<3.99E-05	<6.81E-05	<2.22E-04	<3.87E-04
M	<9.01E-04	<2.05E-04	<4.38E-05	<7.90E-05	<2.23E-04	<6.04E-04
A	<9.01E-04	4.58E-03	<4.08E-05	<7.27E-05	<1.98E-04	<3.66E-04
M	2.15E-03	<4.50E-04	1.58E-03	9.77E-04	2.16E-03	6.84E-04
J	<9.00E-04	7.13E-03	<4.42E-05	<6.14E-05	<1.91E-04	<3.50E-04
J	<9.00E-04	<4.50E-04	<4.74E-05	<6.55E-05	INCOMPLETE	<3.80E-04
A	<9.00E-04	<4.50E-04	<3.28E-05	<5.28E-05	<1.62E-04	<2.57E-04
S	<9.00E-04	<4.50E-04	<2.92E-05	<4.75E-05	<1.57E-04	<2.87E-04

Figure C-1. PUREX Steam Condensate Radiological Release History.
Total Alpha through September 1989.

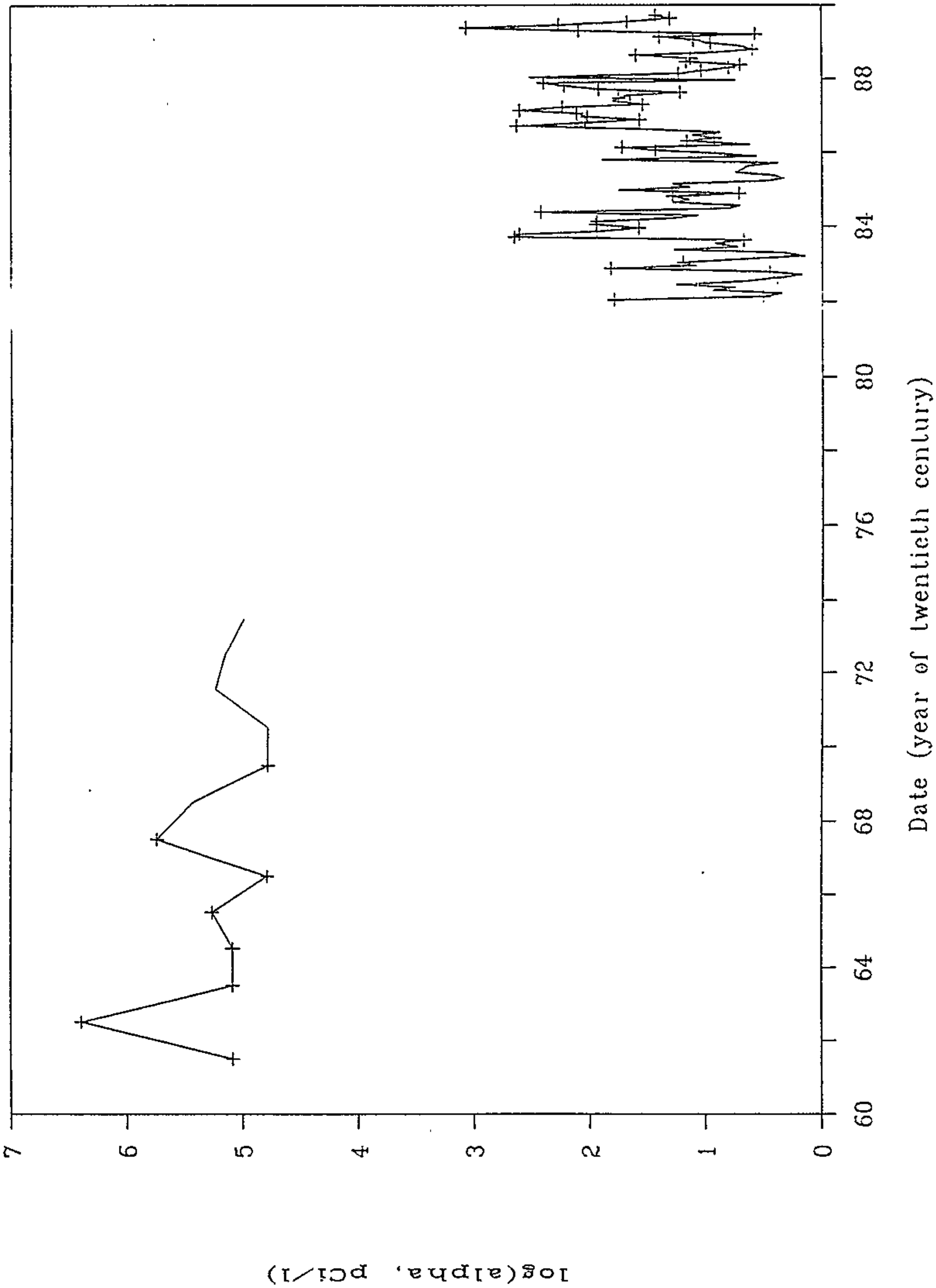

Figure C-2. PUREX Steam Condensate Radiological Release History. Total Beta through September 1989.

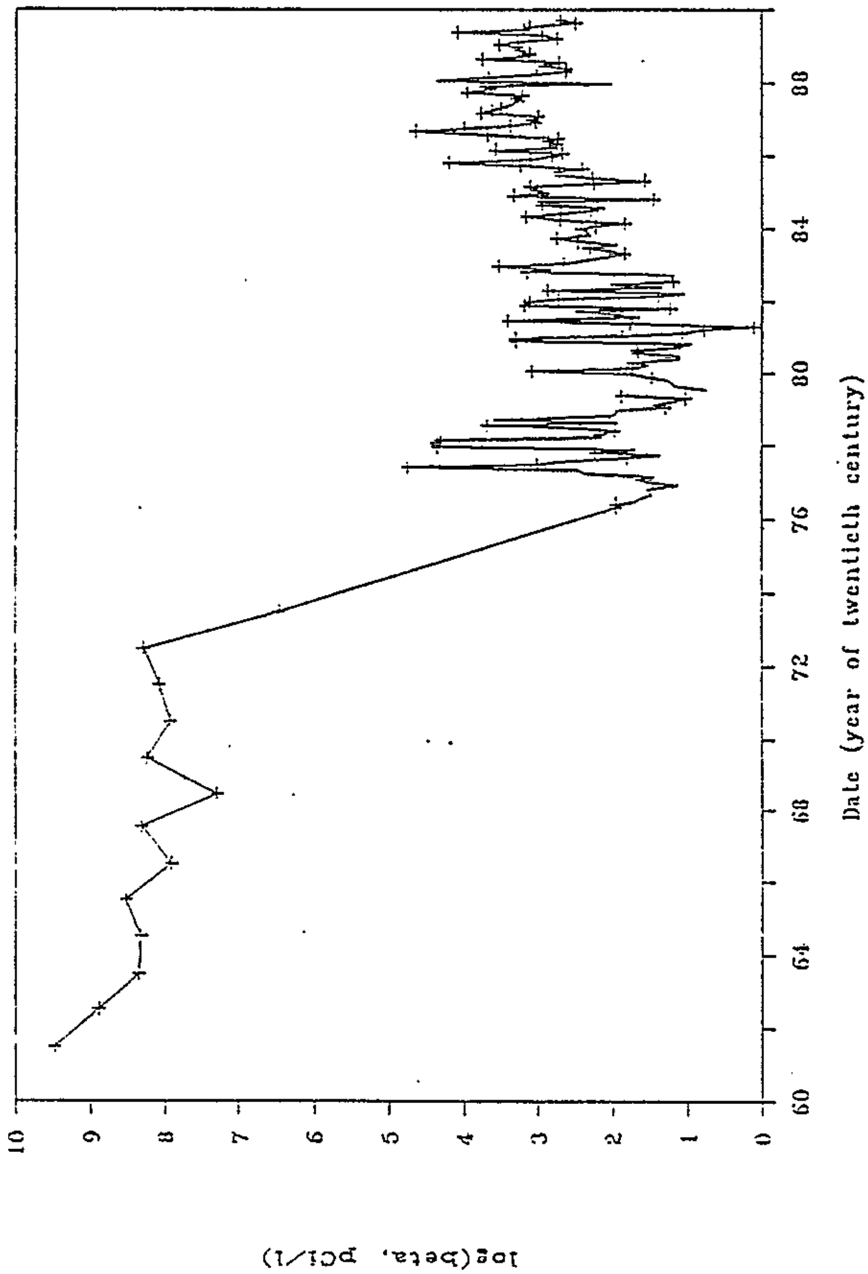

Figure C-3. PUREX Steam Condensate Radiological Release History.
Strontium-90 through September 1989.

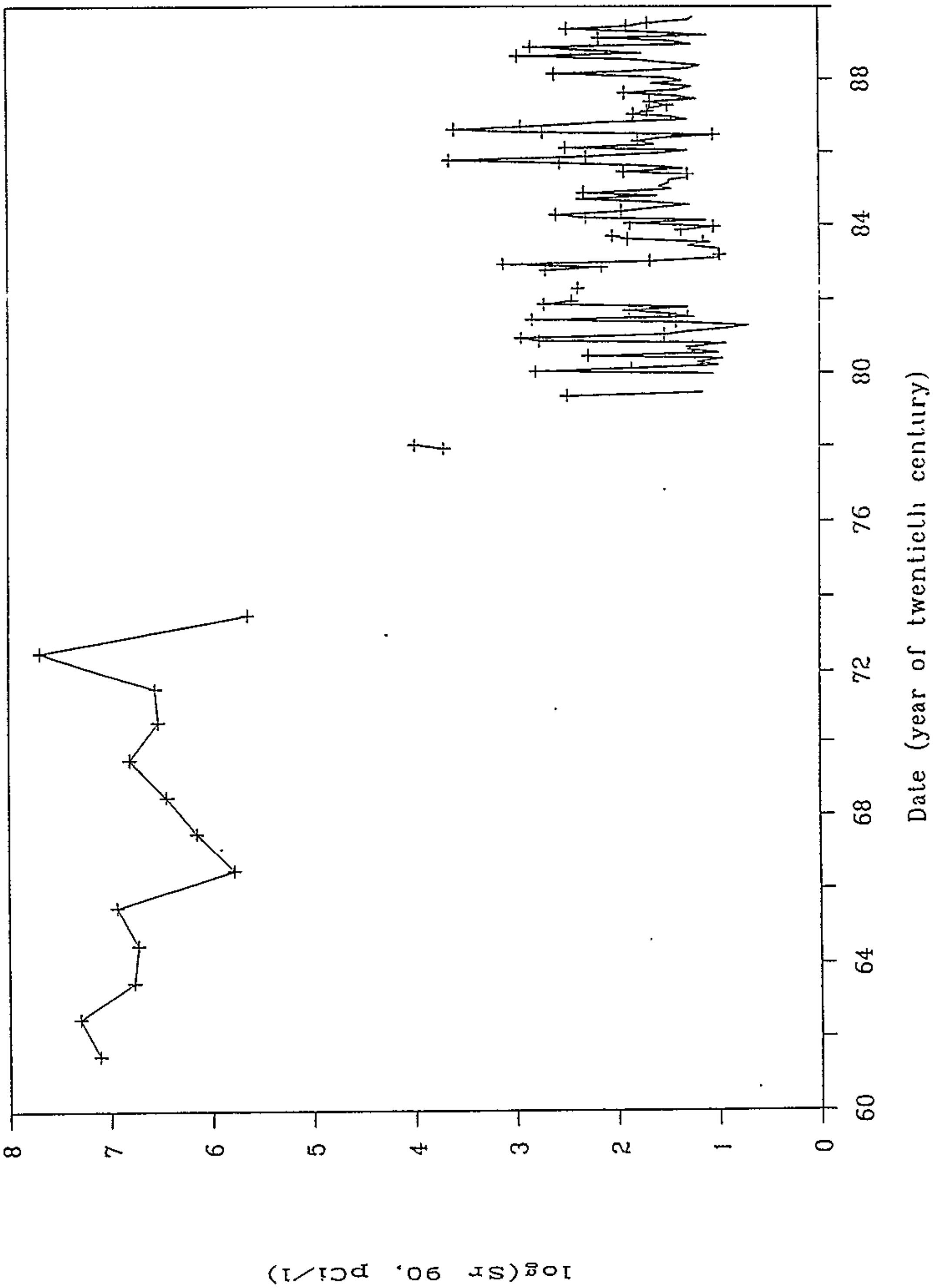

Figure C-4. PUREX Steam Condensate Radiological Release History.
Ruthenium-106 through September 1989.

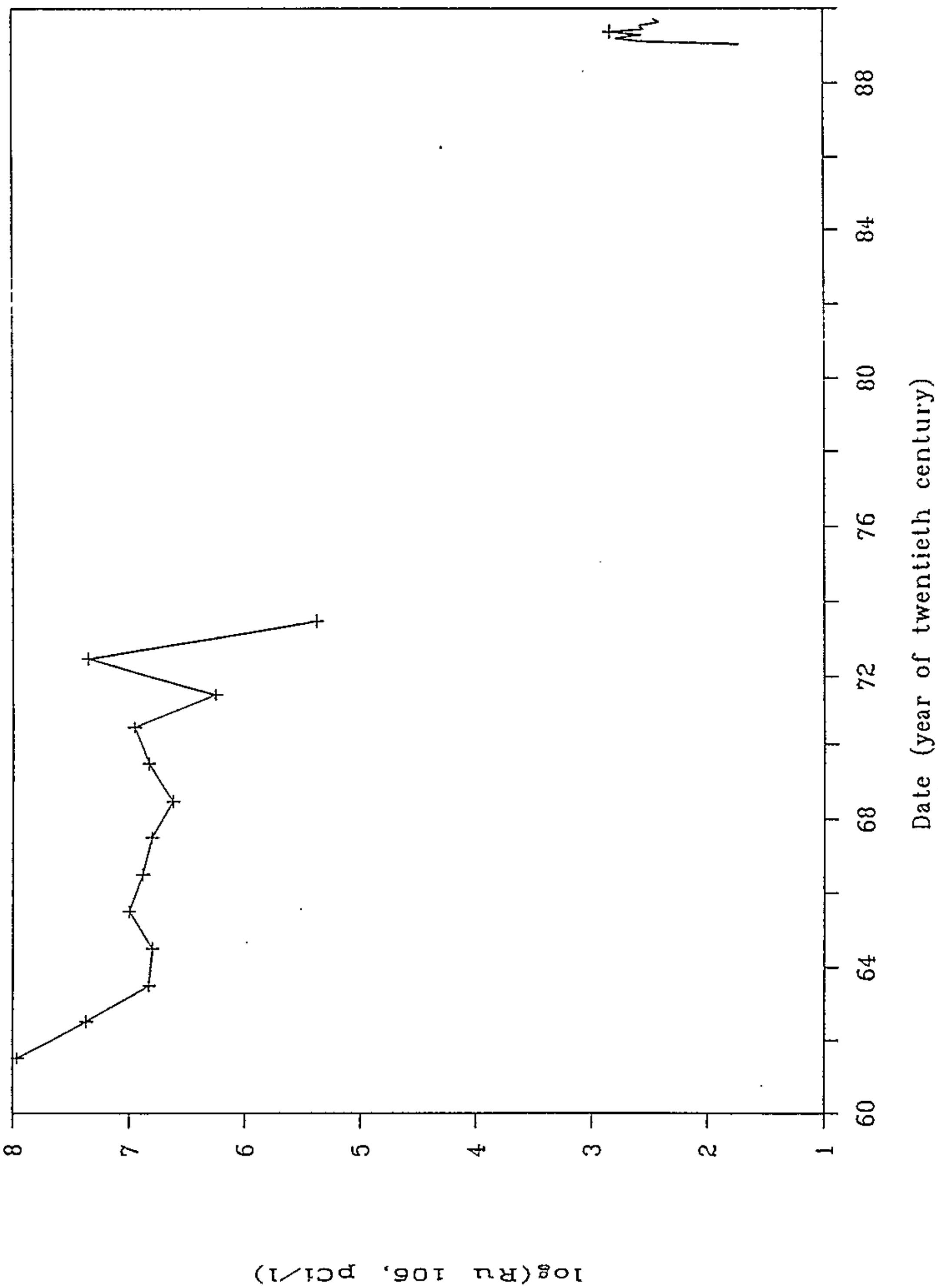

Figure C-5. PUREX Steam Condensate Radiological Release History. Cesium-137 through September 1989.

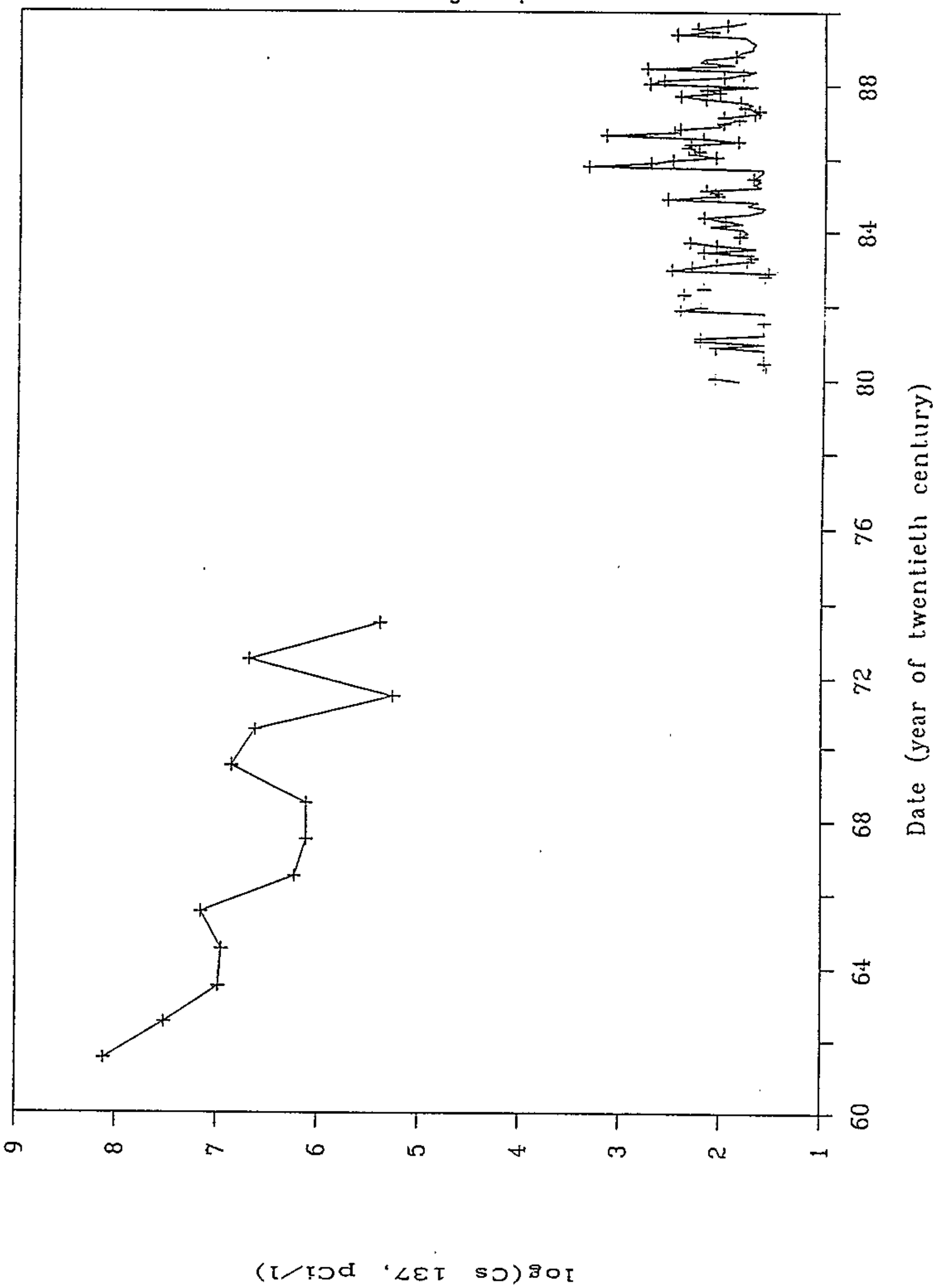

Figure C-6. PUREX Steam Condensate Radiological Release History.
Cerium-144 through September 1989.

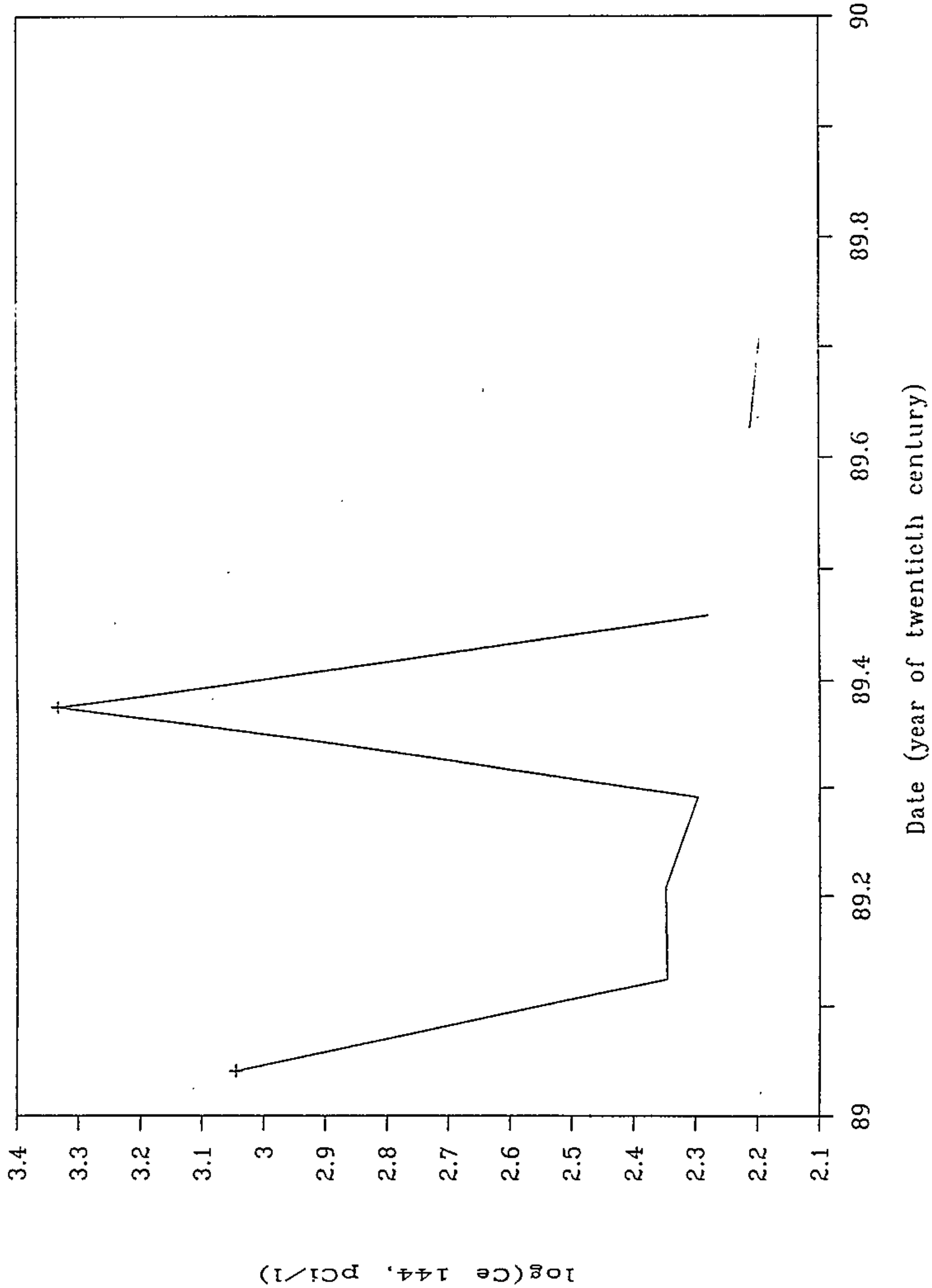

Figure C-7. PUREX Steam Condensate Radiological Release History. Promethium-147 through September 1989.

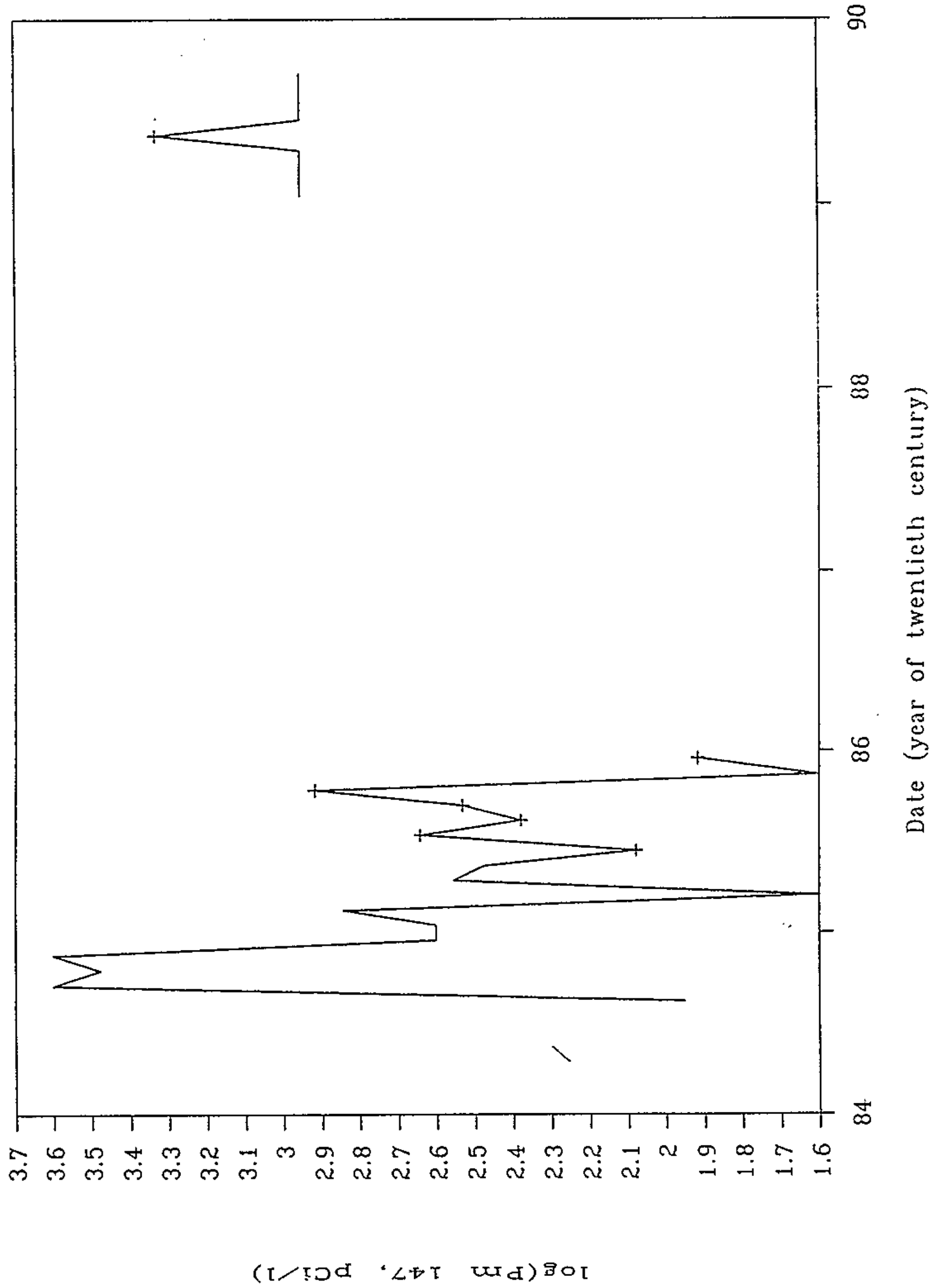

Figure C-8. PUREX Steam Condensate Radiological Release History.
Cobalt-60.

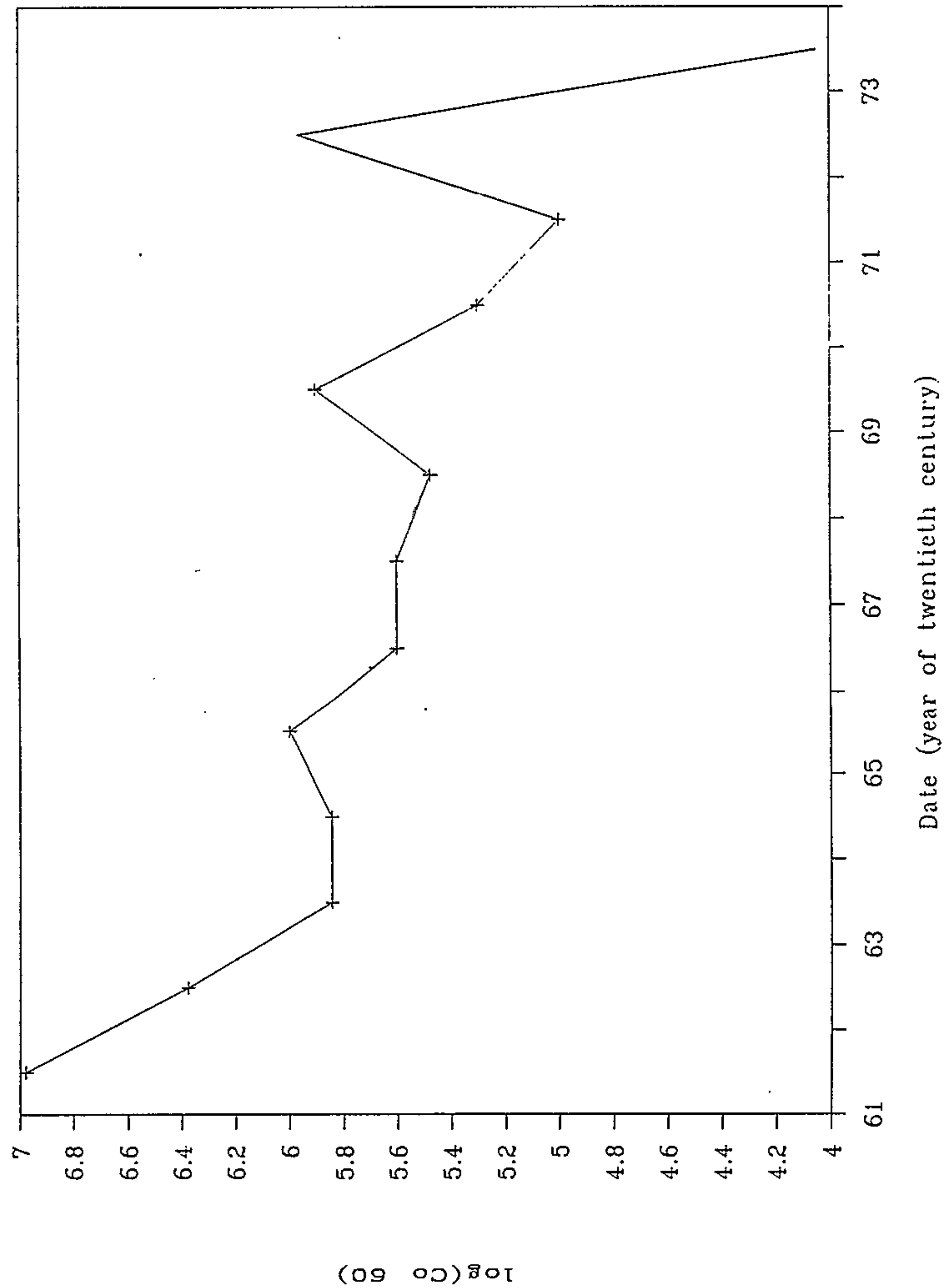

Figure C-9. PUREX Steam Condensate Radiological Release History.
Gross Uranium through September 1989.

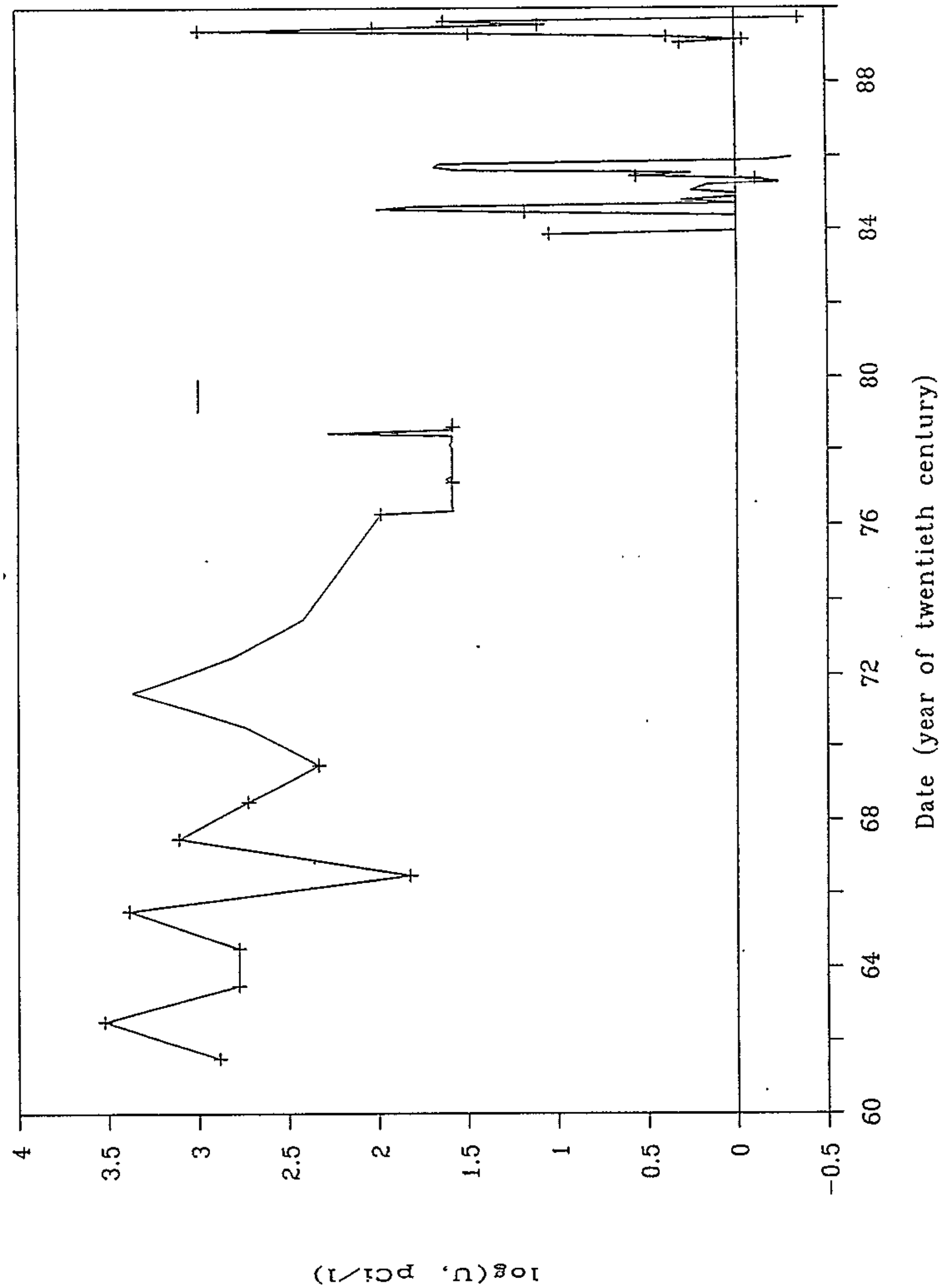

Figure C-10. PUREX Steam Condensate Radiological Release History.
Tritium through September 1989.

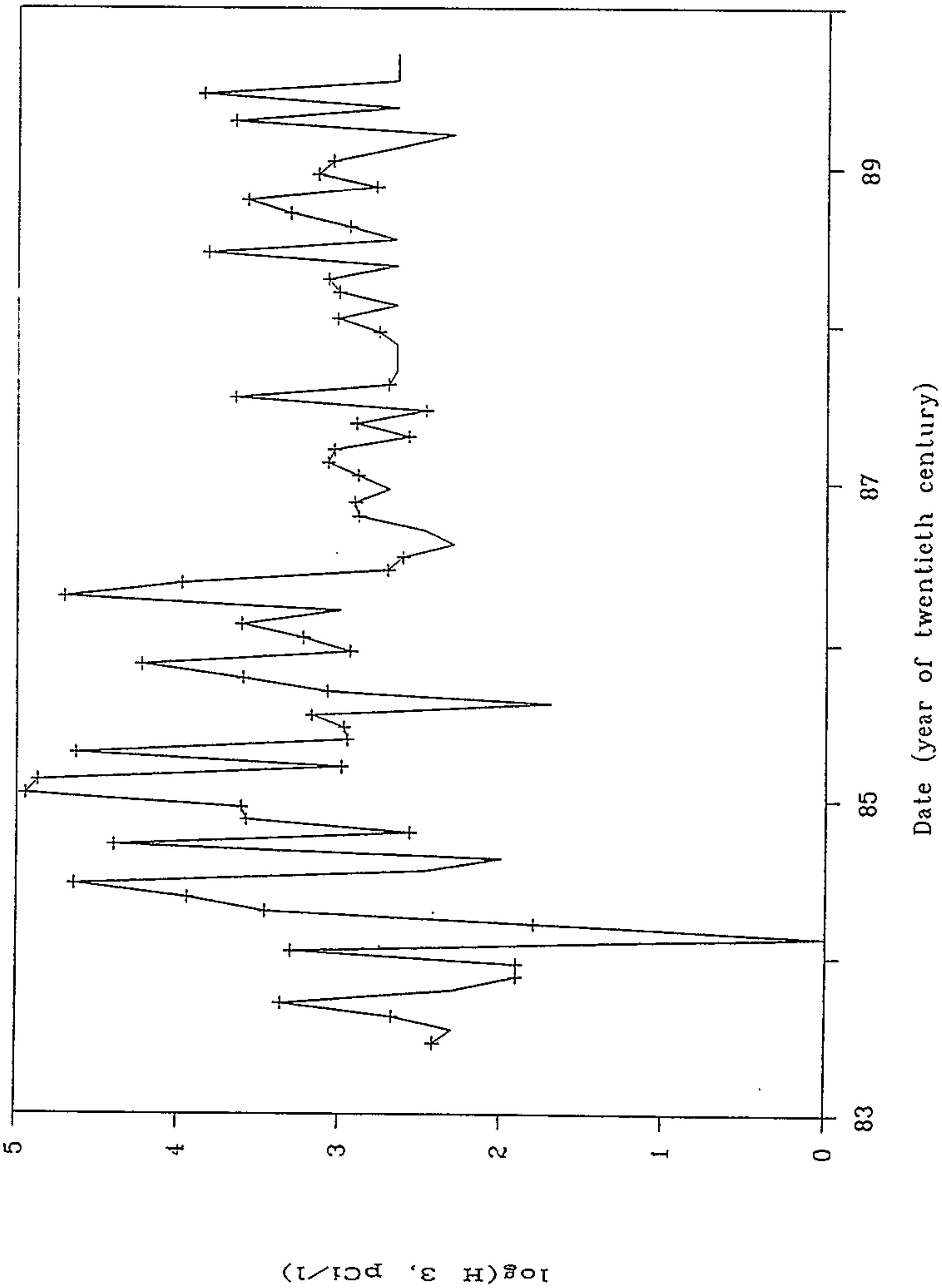

Figure C-11. PUREX Steam Condensate Radiological Release History. Americium-241 through September 1989.

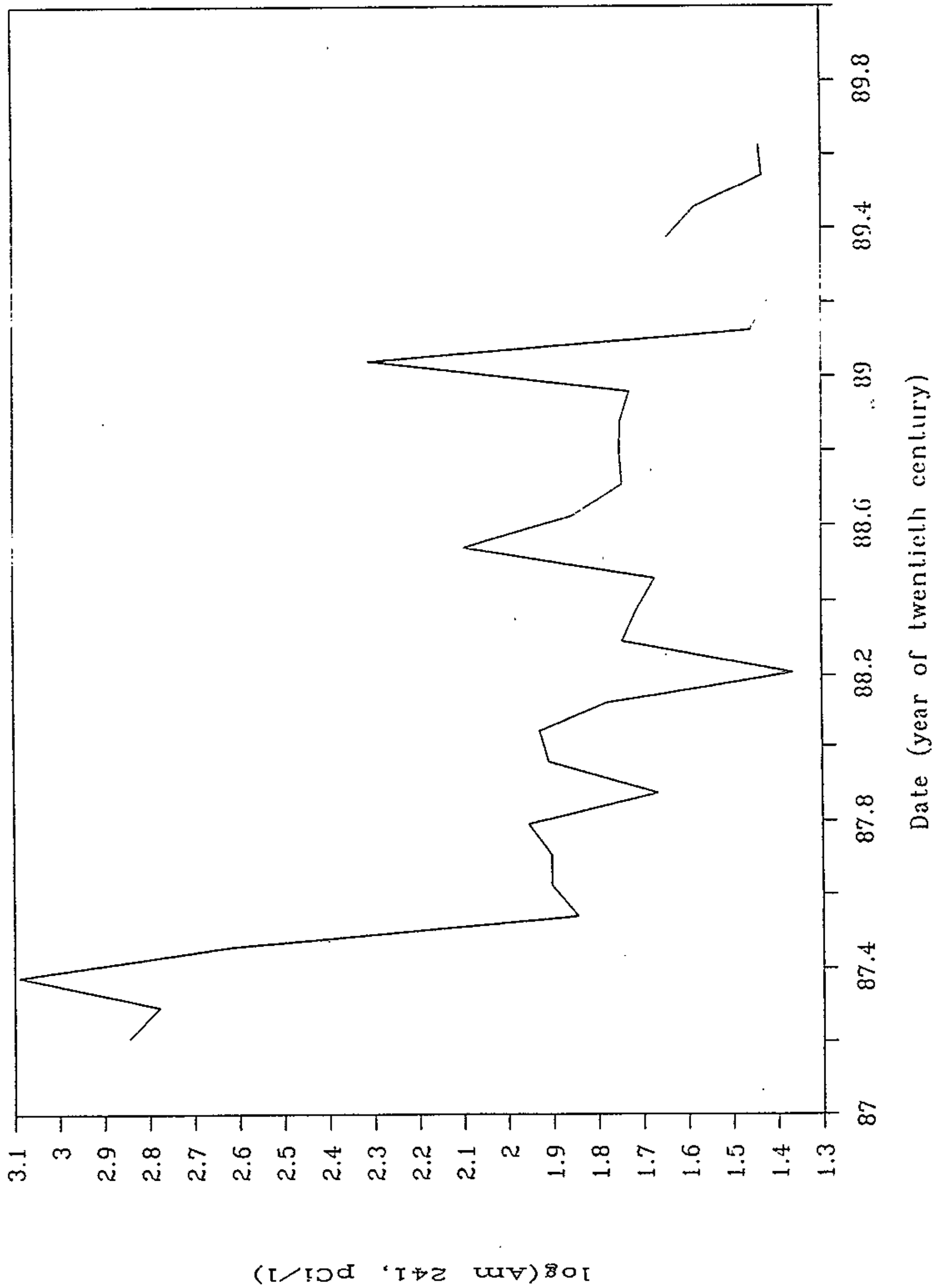

Figure C-12. PUREX Steam Condensate Radiological Release History. Plutonium-239 through August 1989.

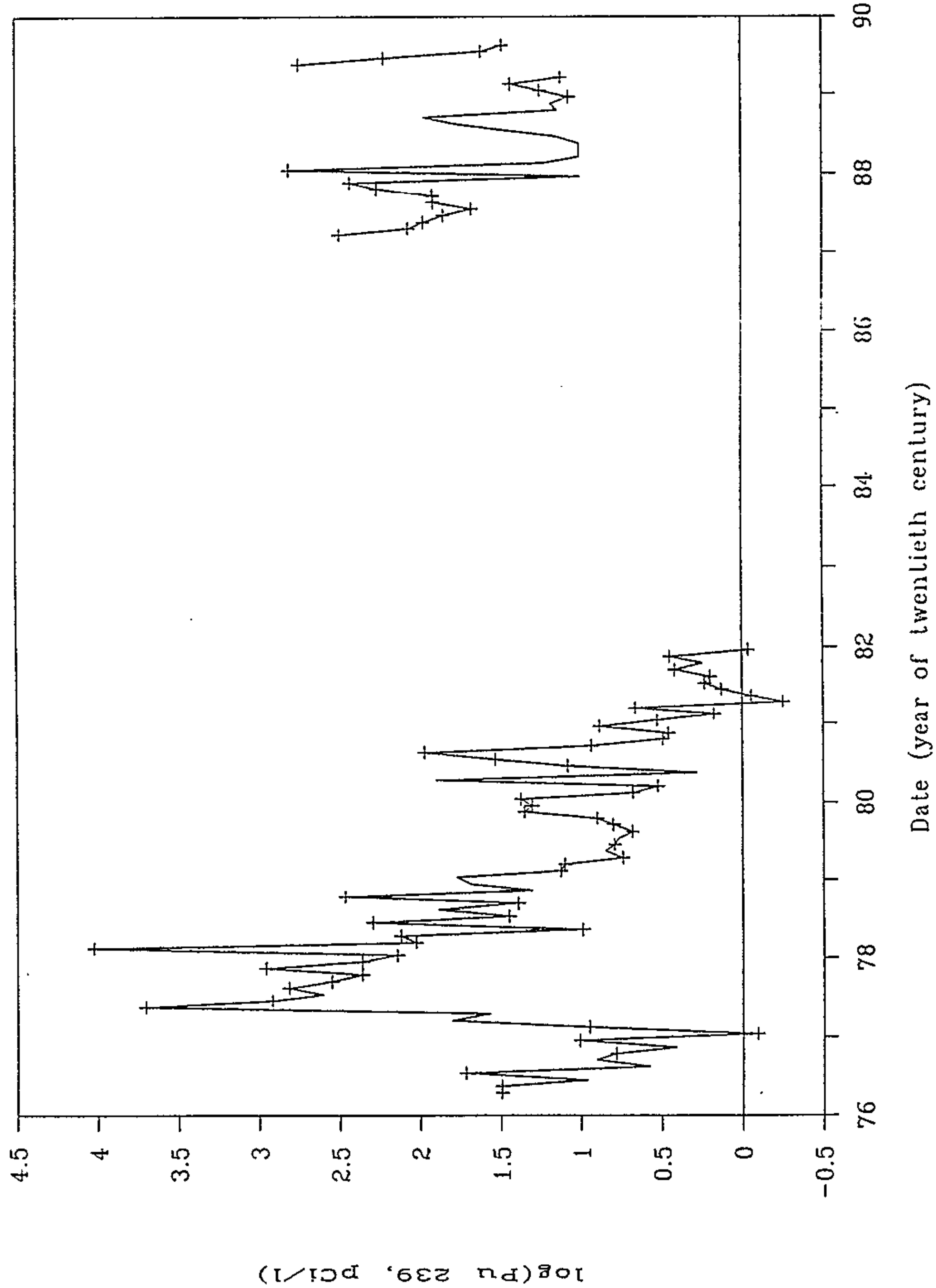

Figure C-13. PUREX Steam Condensate Radiological Release History.
Zirconium-95.

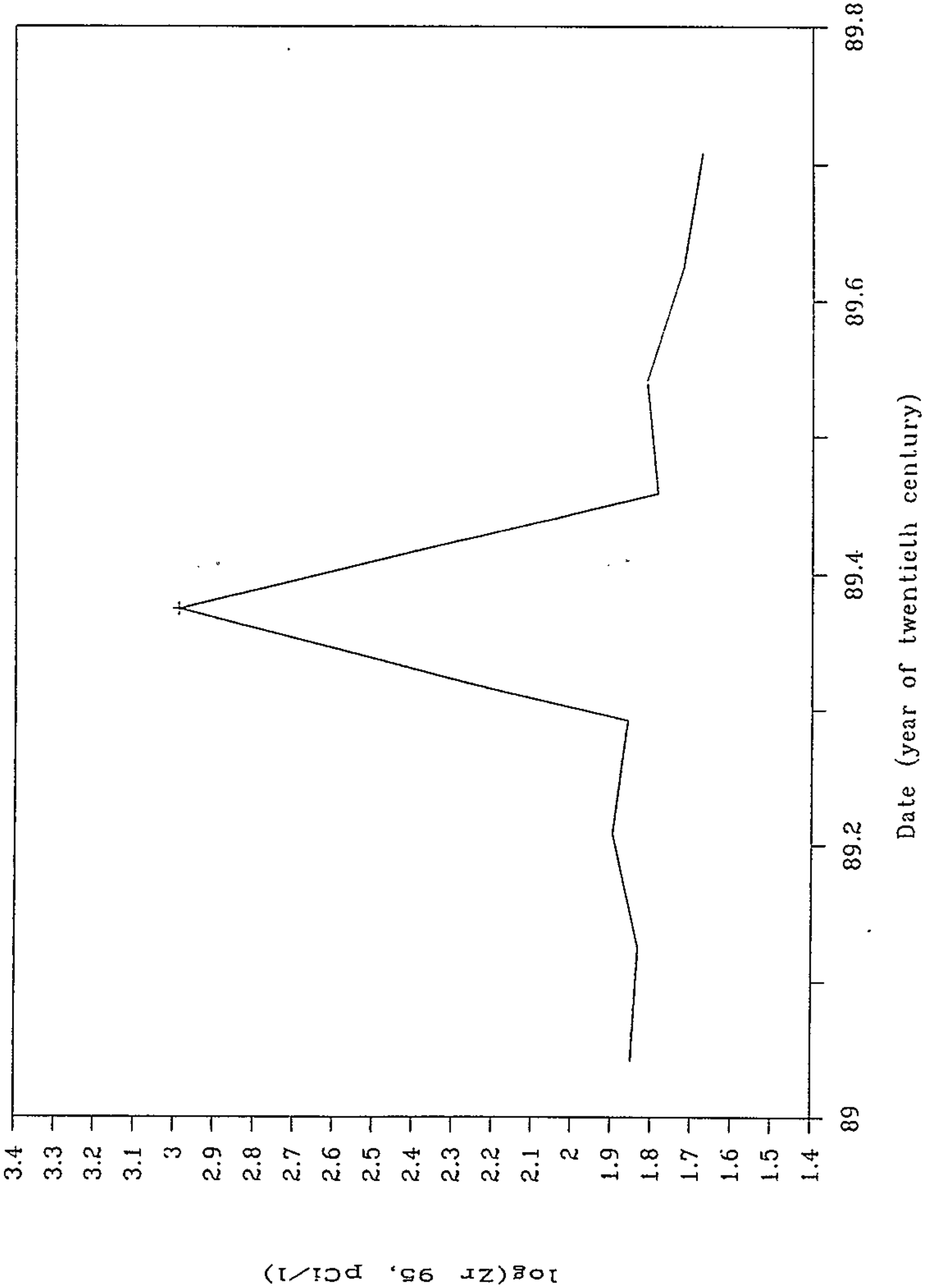

Figure C-14. PUREX Steam Condensate Radiological Release History.
Niobium-95.